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An 8″x20″ Bench Lathe for the Amateur Electrician.

BY HERBERT I. WASHBURN.

In the following proposed design the object has been the utilization of that admirable product—cold rolled steel, in the construction of a machine which has, to a certain extent, the advantages of a slide rest lathe. Suggestions in this line are invited.

The Electrical Testing Set, described in the "American Electrician" of October, 1897, is a sample of the class of work for which this machine is intended.

In the construction, shown by the accompanying sketch, two parallel bars form the shears of the lathe, the rear bar *A* fixed, and the front or chasing bar *B* movable. The tool post *C* may be clamped in any position on *B*, and revolves with it.

The foot-stock may be clamped either to *A* or *B*, or to both. The arm *D* is pinned to the right hand extremity of *B* and engages with the eccentric *E* which is loose on *A*. The stop screws *F*, *G* and *H* limit the motions of *B*. The tool is moved parallel to the axis of the work by the rack, pinion and lever *J*, shown in section *a*—*b*, and vertical to it by the eccentric and lever *E*.

Chucks and face plates are fitted to go on either head or tail spindle.

With a drill chuck on the head spindle, face plate on the tail spindle and the foot-stick clamped to *B*, the machine is approximately a sensitive drill.

The arrangement for screw cutting is shown in sketch. A hob *K* and its corresponding part *L* are secured to the head spindle and to the arm *M* on chasing bar respectively. The part *L* must have sufficient spring to accommodate itself to the depth of thread being cut. For small screws a screw cutting die head may be attached to the tail spindle.

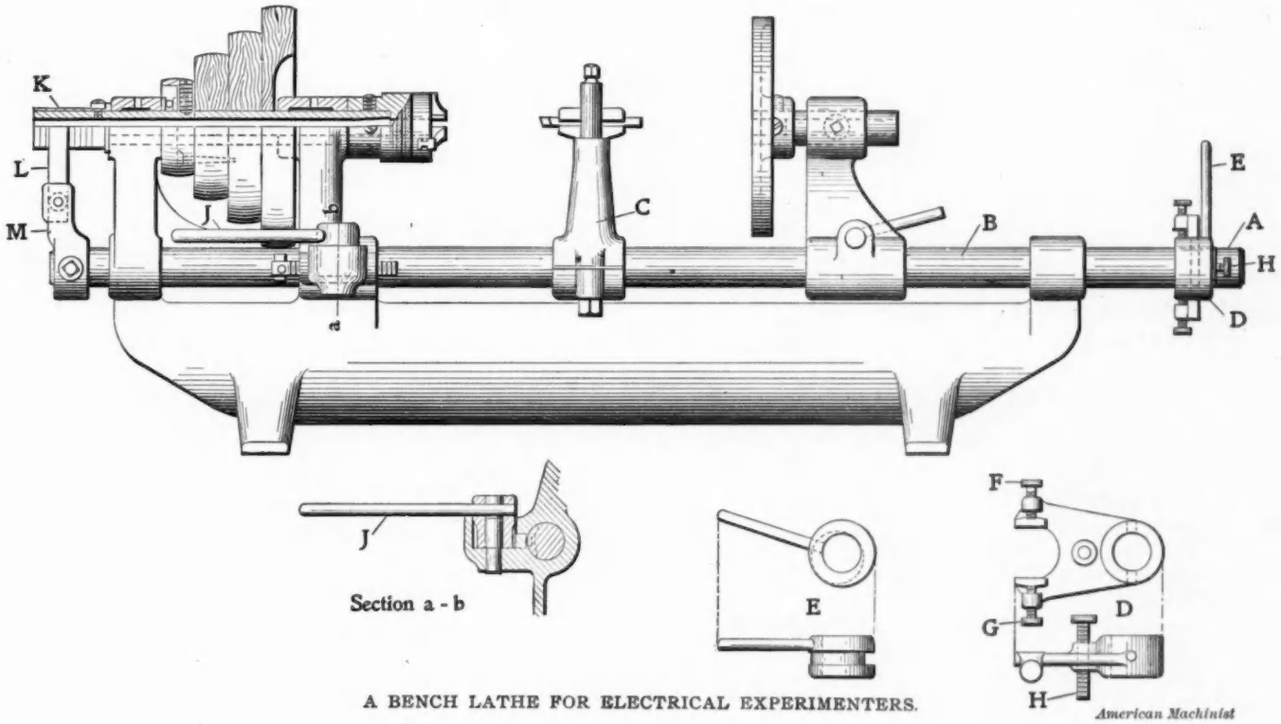
For materials we may use cold rolled steel for parts *A*, *B*, the line spindle and tail spindle. In that case the time required to machine a headstock spindle, 1 inch diameter, as per sketch, may be something less than fifteen minutes.

The hobs are of smooth finish steel tubing, and parts *L* of hard sheet brass.

Sets of lathe tools, drop forged, of ¼-inch stubs steel accompany the machine.

In operation, high cutting speeds and light feeds are desirable, and in the case of a material like tool steel the use of turpentine as a lubricant would be helpful.

Schenectady, November 24, 1897.



A BENCH LATHE FOR ELECTRICAL EXPERIMENTERS.

American Machinist

Since receiving the above communication, some correspondence with Mr. Washburn has brought a letter from him in which he says:

"I have thought that possibly a better arrangement of the parts would be to have the rack and pinion mechanism on the right-hand end of the frame and the fork and eccentric to the left. The left hand of the operator would then be free to hold work on the face plate while drilling, etc., and the portion of the bar under torsional stress, while screw cutting, would be diminished.

"It is intended that the foot-stock may be clamped firmly to the rear bar so that it will act as a support for the front bar,

and also that in case the lathe is driven by foot power a jeweler's foot-wheel may be used; since a bench is a necessity in any amateur's shop.

"I have had the pleasure of using small boring tools, made of Stubs' steel, and find them convenient, in that the clearance, top rake and projecting length of tool may be adjusted at pleasure.

"Although the length of cross-feed obtained by the fork and eccentric may be quite sufficient for the class of work named, I believe some would prefer a greater range of movement, and I think it possible to devise a mechanism to accomplish this without greatly increasing the cost of the machine, but would not like to add any other devices, such as those used for taking up wear, etc., as they would so increase the cost as to place it beyond the reach of many of the young mechanics for whom the lathe is intended. I would like to see it receive the attention of a half dozen good designers and then manufactured under the favorable conditions of special tools and production in large quantities.

"The result would be, I believe, a machine the possession of which would be a pleasure to many, from the practical man down to the small boy. There are other boys who are like a certain Captain Bates, who, when a lad, watched for two hours from the top of a tall tree for the appearance of a wagon which was to bring him a lathe."

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Die for Punching Holes in Armature Blanks.

BY WM. BAXTER, JR.

The die for cutting armature blanks described in a previous article does not punch the rivet holes, this part of the work being accomplished in a separate operation by means of the die shown in the accompanying cuts. As is well known, the blanks could be finished, holes and all, in one operation, but there is a difference of opinion as to the benefits to be derived from such a procedure. By some it is believed that the more work that can be done at one stroke the better, but others consider that the additional complication of the dies completely offsets all that is gained in the operation. The cost of punching the holes after the blanks are cut is very small, and as a compensation for it may be mentioned that the dies being less complicated are not so liable to get out of order, a greater number of pieces can be cut without stopping to sharpen up, and if one die gets out of order it does not interfere with the use of the other.

The die for punching the holes is inexpensive to make and to keep up. It consists of a cast-iron bolster shown in plan in Fig. 1, and in side elevation with a section of part of it along the central line in Fig. 2. The cutting edges are obtained by inserting in the bolster steel bushings *D* the proper distance apart. These bushings are held in place by screws *E* made with extra large beveled heads, so as to lap over the bushings without being placed so close thereto as to cause the metal between the screw hole and the bushing hole to give way. The bolster is made with a raised portion in the center, within the line *A*, shown in Fig. 1, and three other spots, marked *B B* and *C*, are sufficiently elevated to allow of their being planed off. The spots *B B* are for holding the stops against which the blanks are held to bring the holes in the proper position. The surface *C* is for holding the stripper. These three surfaces are made lower than the center surface, so that the blanks may strike the stops so far above the bottom as to obviate all possibility of their working under them should they become loose, and also so as to not prevent the blanks from coming into direct contact with the stop by the accumulation of chips and dirt, a trouble quite likely to occur when the die surface is not cut away in front of the stop. For the latter reason a considerable amount of space is left between the center raised surface and the stops. The difference in the hight of the several surfaces can be seen clearly in Fig. 3. The rough surface of the casting is shown at *L*. *A* is the center and *C* the surface upon which the stripper *S* is held. This surface and that of the spots upon which the stops are held are on the same line, so as to be dressed off at the same time. As will be seen, the blank *B* cannot wear away the corner of the stop, and thus gradually shift the holes out of their true position, because it strikes far above the lower surface. At the same time it is not possible for dirt and chips

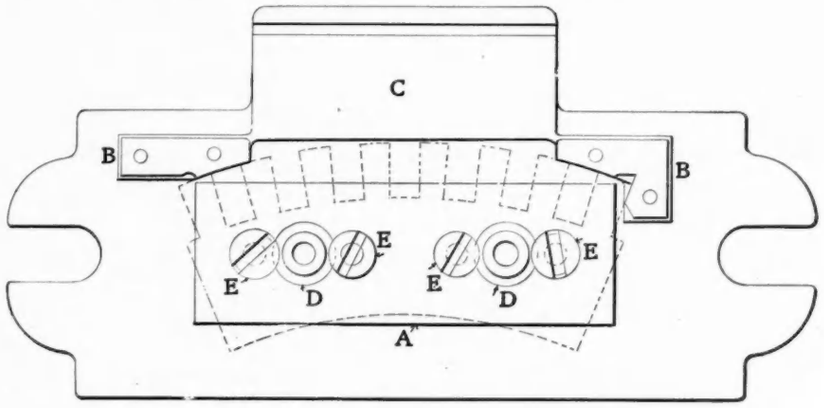

Fig. 1

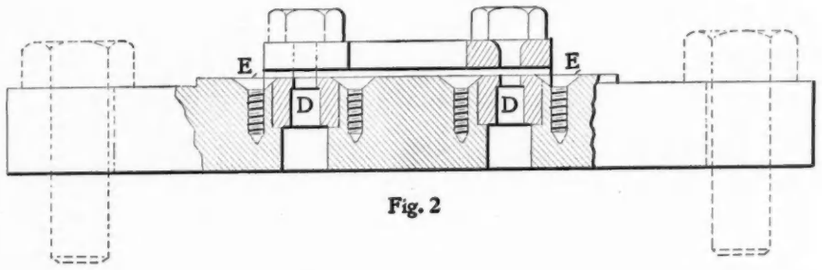

Fig. 2

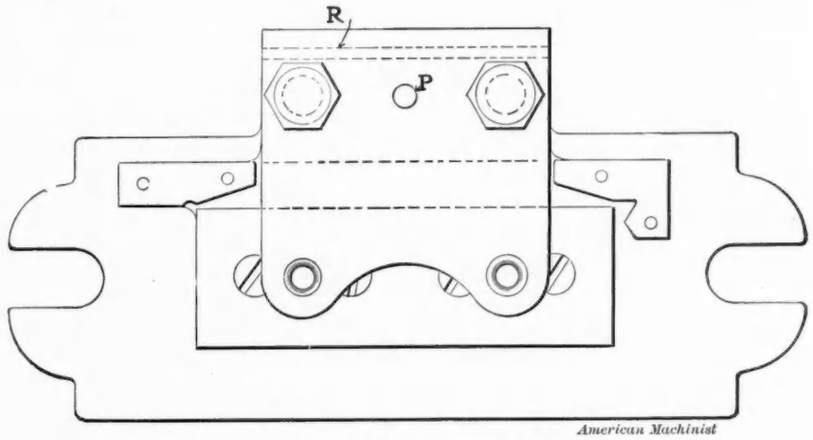

Fig. 7

DIES FOR HOLES IN ARMATURE BLANKS.

to prevent the blank from coming in contact with the stop unless the accumulation is far greater than would occur in a well regulated shop.

The construction of the punches is somewhat different from that ordinarily followed. The most common form for a round punch is that shown in Fig. 4, which is generally made by upsetting a bar of steel large enough to form the shank, and then drawing it down for the end. In finishing it up, the cutting end is made smaller above the point. Such punches are expensive to make in comparison with those used in the die here described, and shorter lived, as, in consequence of the taper given to them, they can only be worn down a small distance when they become too small to cut a clean hole. The punches shown in Figs. 5, 6 and 3 are made of Stubs' steel, which is cut off to the required length, a groove being turned in the upper end. These punches are secured in a holder shown in Figs. 5 and 6, which consists of a main part *A* and a clamping piece *B*. The holes in which the punches are held are located one-half in *A* and one-half in *B*. The bolts *C* hold the parts together. Pins *D* are provided to engage

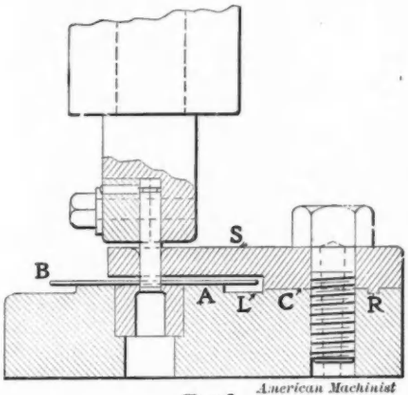

Fig. 3

CROSS-SECTION OF DIE AND PUNCH.

with the grooves in the ends of the punches to hold them from being pulled out should they stick tight in the die or blank. These pins are made of a diameter greater than the width of the groove and are filed down to the proper size, thus giving a flat surface to bear against the side of the groove. They are made of steel and are hardened.

The stripper is made to fit the punches so as to guide them the same as the the stripper of the cutting-out die, but the stripper being small in this case is made of steel, and therefore becomes a more perfect guide than the stripper of the larger die. The holes are flared out on the upper side so as to not catch the punches. This is shown in Fig. 2 and also in Fig. 3. As the stripper guides the punches, the holes in it must be in line with those in the die, and the construction must be such that when the apparatus is assembled no time may be required to adjust the position of the stripper. This is accomplished by a tongue and groove, as shown at *R* in Figs. 3 and 7, and a taper pin shown in broken lines in Fig. 3 and in full line as a circle between the bolts in Fig. 7.

As the rivet holes in the blanks must be the same distance apart as those in the end rings of the armature core, the proper distance in the die is obtained by transferring the holes from the jig used to drill the armature rings. The best course to follow is to mount the stripper in place and fill the space between it and the face of the die with a sheet of iron accurately fitted, then drill through stripper into the die. By means of a counter-bore the small holes in the die are enlarged to the size of the bushings they are to receive. The holes in the punch holder can be transferred from either the stripper or the jig above referred to. As it is not an easy matter to drill holes central with a joint between two pieces of iron, it is best to drill the holes in the punch holder before the metal is cut away and the clamp *B* is fitted in place.

The grooves in the ends of the punches are not absolutely necessary, but it is best to have them, because sometimes the punches stick very tight in the sheet iron, and on such occasions, if the clamp *B* is not screwed up with sufficient pressure, the punch will be drawn out and damage may be done.

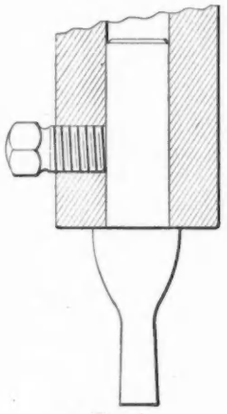

Fig. 4

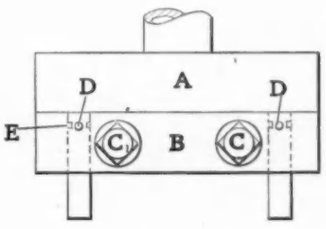

Fig. 5

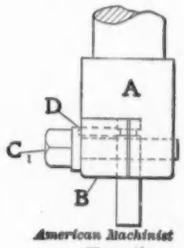

Fig. 6

CONSTRUCTION OF PUNCHES.

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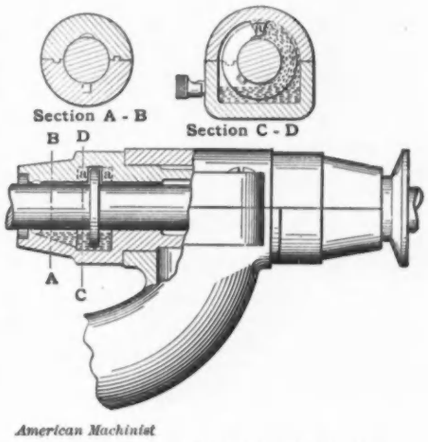
An Improvement in Ring Oiler Bearings.

The accompanying illustration shows an obvious improvement on the now common high-speed bearing having a loose ring riding on the shaft and bringing a constant supply of oil from an oil cellar. It is obvious that most of the oil brought up by such a ring will be carried back again by adhering to the ring, the oil supplied to the bearing being only the small amount taken by contact of the shaft with the inner side of the ring. This in any case is small, and in the case of very high-speed bearings, where the device is needed most, the centrifugal force of the oil on the ring will cause it to collect about the outer circumference of the ring, and simply go round and round with the ring—a very small portion only actually finding its way to the bearing.

In the present bearing—which is applied by the Builders' Iron Foundry, of Providence, R. I., to their grinding and polishing stands, the loose ring is replaced by a collar, which is forced on the shaft and revolves with it. The collar dips into a capacious oil cellar below as usual, and a wide circumferential channel is cast in the box for the ring to revolve in, except that at the top this channel is obstructed by projections *a*, which provide only sufficient room for the collar to revolve freely. Their office is to scrape the oil from the ring. This not only deposits it on the top of the box, but the force with which the oil strikes the projections causes it to shoot down the channels provided for it endwise of the bearing. Collecting grooves are provided at the end of the bearing, as well as free return channels to the oil cellar. The obvious result is a positive flooded circulation of oil throughout the bearing.



IMPROVED RING OILER BEARING.

A Forming Die.

BY A. H. CLEAVES.

I saw a rather novel method (at least novel to me) of making a bending die some time since that may interest others.

In Figs 1 and 2 a piece of rubber *A* held in a little brass box *B* is shown. The box *B* was riveted to a steel piece, and made with the rubber, a hammer or striker for printing as in a typewriter, the figure or letters being on a cylinder instead of on the rubber.

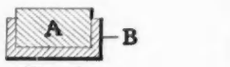


Fig. 1

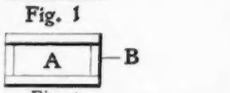


Fig. 2

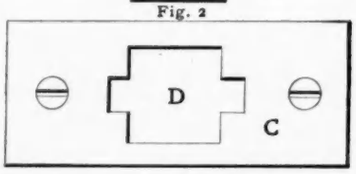


Fig. 3

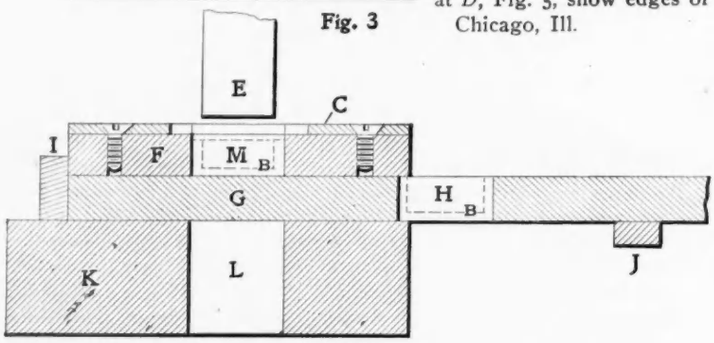


Fig. 4

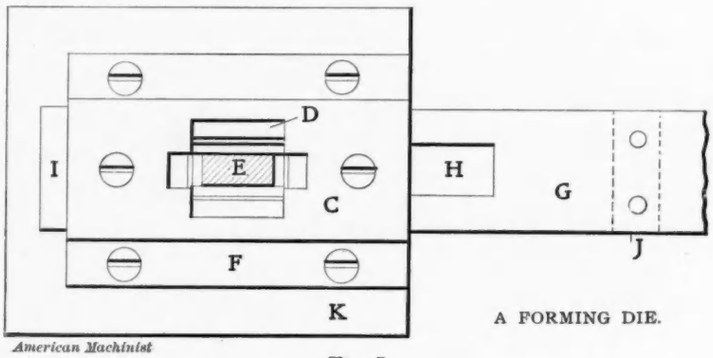


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Fig. 5

In Figs. 3 and 4 the plate *C* is a guide piece for locating *B* for bending, the latter being the shape of the opening *D* in *C* when first punched. The bending punch *E*, Fig. 4, is shown in section at *E*, Fig. 5.

B while in the shape of *D*, Fig. 3, is placed in *D*, and the first operation pushes it down into *F*, as seen at *M*, the plate *G* being in the position shown in Fig. 4.

This gives the punch *E* a chance to form the piece *B* in good shape as it rests on *G*.

I is a stop to keep *G* from being pulled clear out, and *J* is a stop at the other end of *G*, to stop the latter when the opening *H* in *G* comes exactly under *M*.

When *H* is under *M* a second blank for *B* is put into *D* and pressed down as before, this second piece pushing the first one at *M* into *H*. The slide *G* is then drawn back into the position shown in the drawing, with one piece *B* in *H*. Then the punch *E* is brought down into the piece in *M* to shape it on *G*, as was done with the first piece. *H* is next brought under *M* again, and when a third piece is pressed it pushes *B* from *M* into *H*, and this forces the one already in *H* into the outlet *L*.

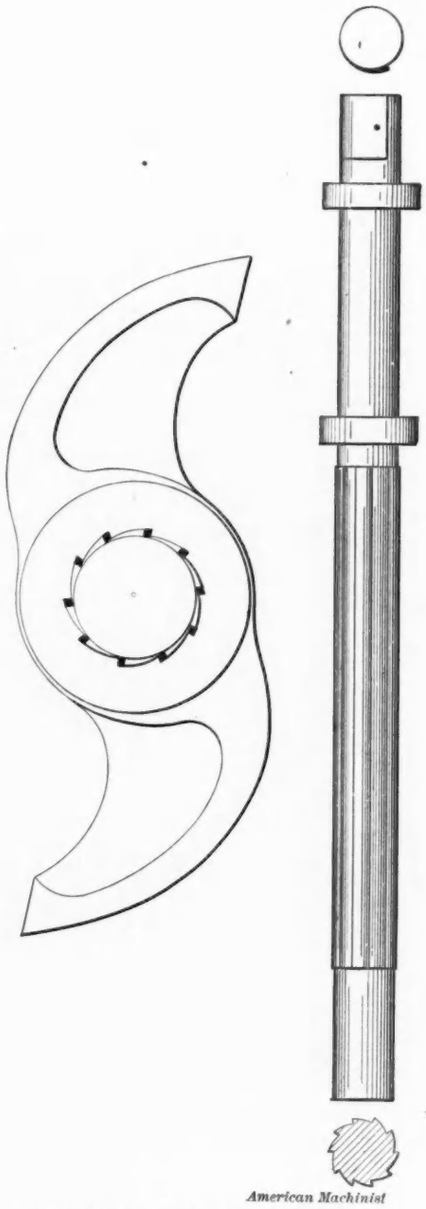
This operation is repeated now to any extent, two strokes of the press being given to each piece, one to bend, and one to press the piece home, every alternate or bending stroke pushing a piece out through *H* into *L*. The double lines at *D*, Fig. 5, show edges of die rounded.

Chicago, Ill.

A FORMING DIE.

The Blanton Self-Tightening Cam.

Our readers who are not familiar with the device will be interested in the Blanton self-tightening cam, used by Fraser & Chalmers in their stamp mills. All will readily understand the difficulty of holding the cams of a stamp mill securely and in their proper relative position by keys or any of the familiar methods, and all will at once see how easily and certainly it is accomplished by the means shown in the cut. The shaft has ten slightly eccentric faces and the hole in the cam corresponds. The cams slip on with perfect ease and a slight turn in the direction in which the working shock occurs tightens them and holds them securely. The harder the work the tighter they hold, while a hammer tap in the opposite direction releases them at once. Usually five or ten stamps are used in a set, so that the cams may be set either one or two steps in advance of each other, and the work thus be equally distributed over the revolution. As the holes and the shaft surface are made true and perfectly symmetrical, the bearing is, of course, all around the shaft.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THE BLANTON CAM AND ITS SHAFT.

The principle is widely or almost universally applicable when the drive is always in the same direction. It will be noticed that the driving pulley on the end of the shaft has a single eccentric bearing on one side, by which it is tightened.

A Visit to the Home of James Watt.

Birmingham, England, has many claims upon the interest of the engineer, but none is likely to be more impressive than the things one sees there that remind him of James Watt and of his scarcely less able partner, Matthew Boulton.

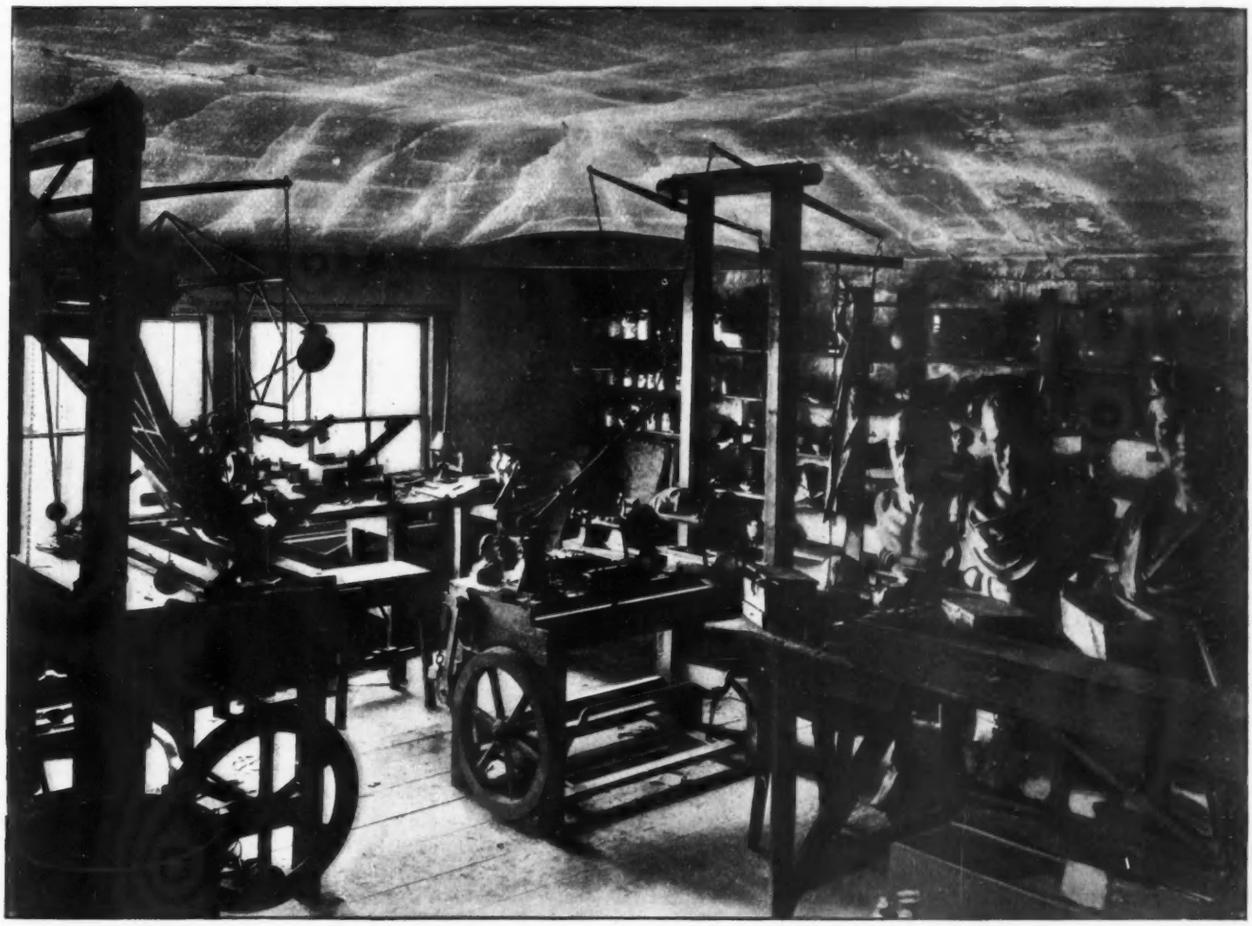
In Soho, which is included within the city limits, stood the famous workshop in which the first steps of the machinist's art as we now know it were taken, and in which engines were built that showed to the world how to make really practicable use of a source of power which has produced effects upon the human race so far beyond our computation that we can only dimly imagine what manner of life we should be leading to-day without it.

In that part of Birmingham known as Heathfield stands the house in which Watt lived during the later period of his life; after his earlier and very severe struggle with engineering and business difficulties, aggravated by his own delicate physical condition, had been surmounted, and he was able to enjoy in peace some of the fruits of his long and severe labors.

I experienced the pleasure of a visit to this house one day last spring. It stands in what is virtually a small private park, and when Watt lived there must have been, as it is now, a very attractive place of residence.

In an upper rear room of this house was Watt's den, in which he spent most of his time with his tools and in experimenting upon the solution of various mechanical problems. The room stands to-day practically as Watt left it when, in 1819, he died. I was permitted to explore this room and present herewith a reproduction of a photograph of it, for which photograph I am indebted to Mr. Harry Tangye, whose home is with his father in this house. By him it was taken from a point near the door leading into the room and looking toward the only window in it. In front of this window and where, as he worked, he had before him a view of luxuriant and well-kept shrubbery, stood Watt's work bench, and in other parts of the room were various machines of his own construction and his foot lathe, all with the tools lying about as Watt left them.

For some time previous to his death Watt was interested in the problem of producing a machine for copying sculpture, carvings, busts, medallions, etc., and two of these machines, built by him, appear in the picture. In the middle-ground is seen the smaller one of these, resembling a foot lathe somewhat, but with two pairs of index centers placed across the bed. In one of these centers the carving or cast to be copied was placed, while in the other was the work to be carved. Upon the former a finger, attached to a hinged lever above, was moved about, while a small cutter attached to a spindle, also supported by this lever, reproduced the motion of the finger upon a smaller scale, and thus gave a reduced copy in the other pair of centers. The wheel, belt, idlers and belt-tightening device are plainly indicated, and it is clear that, by indexing the model



JAMES WATT'S PRIVATE LABORATORY.

and work similarly by means of the index plates and following the contour in each position, exact duplicates could be made, and by shifting the index centers upon the bed to various distances apart the reduction could, of course, be to any desired scale within the limits of the machine.

The machine at the left is a more elaborate construction for the same purpose, but is incomplete. I believe it is not known whether Watt had completed it and had partly dismembered it afterward, with a view to making changes, or whether it had never been completed.

In the background are shelves containing jars for Watt's chemicals; he was interested in chemistry also.

The ceiling of this room slopes at the corners on three sides, owing to the fact that it approaches closely to the roof. It must have been rather a warm workshop in summer time and a cold one in winter; but Watt evidently loved it, and just outside the door, at the head of the stairway, is the small shelf on which things he might want were deposited and left until he chose to open the door and get them; for he would permit no intrusion within this room when at work in it.

As is apt to be the result of a visit to an historically interesting spot, this visit to Watt's home has led me to a renewed study of his life and achievements, and to a more vivid realization of a few leading facts that are often obscured and sometimes lost sight of.

It is not the fact that Watt's attainments in the work of improving the steam engine were the results of an incidental job of repairing a model of an engine, and that the same thing might have occurred to any other good and intelligent mechanic to whom the job might have been given. Watt had been for years preparing himself for just the work he finally accomplished. This preparation was an unconscious one, because Watt could not have known in advance much, if anything, of the nature of the problems he was finally to solve, and the solution of which was to give him immortal fame. But he was an ardent student of the physical sciences, and when he had a small shop in one of the buildings of Glasgow University, in which he constructed and repaired instruments, he made this shop a rendezvous for the professors of the institution, who found great pleasure and mental stimulus in conversations with him on scientific subjects. By this previous study, which seems to have been prompted only by the love of study and a natural desire to understand the why and wherefore of things, he prepared himself for his great work. Had not Watt undertaken to repair the model of a Newcomen engine he might never have given us the modern form of that machine; but he would almost certainly have made his mark in some other way, and, on the other hand, all the jobs of engine-model repairing that could be imagined, placed in the hands of ignorant, thoughtless and unprepared men, would never have led one of them to improve the steam engine as Watt improved it. The lesson of Watt's life seems to be that no genuine thinking is likely to be thrown away, and that, though it is true that the equipped man *may* never be able to rise to eminence, because the favorable opportunity may not present itself to him, yet all the opportunities in the world will never make eminent the one who is unprepared to make use of them.

It is doubtful, however, if Matthew Boulton is by the general public given his fair share of the honor attaching to the achievements of the firm. Watt's health was delicate; he was greatly troubled with almost constant headaches, and he had anything but a hopeful nature. His letters, written to Boulton during periods when Watt was away, setting up or looking after engines, show that he took the gloomiest possible view of everything connected with the business. Their debts troubled him and he worried about them. Mine owners, for whom the firm had installed pumping engines and had thereby rendered profitable what would otherwise have been utterly useless mines, tried by every manner of means to evade payment of the agreed upon royalties, and this was another cause of worry for Watt, and inspired many a doleful letter, which Boulton had to read, answer in such a way as to encourage Watt as much as possible and at the same time conceal from him his own anxiety regarding the very large and, at that time, rapidly growing indebtedness of the firm; a burden of debt, in fact, which seems to have been at times very near the point of swamping the enterprise.

Boulton not only possessed the original capital and the credit which were necessary to success, but he was a persistent worker; he never gave up; he was a good manager for their workshops; was well liked by the men who worked in them, and had the faculty of making a favorable impression upon all classes of men and of gaining their good will.

Boulton himself also did some creditable things in a mechanical way. He greatly improved the art of coining, and installed in Soho a plant of coining machinery that was much better than any that had preceded it. Without Watt Boulton would still have been a successful manufacturer and an honored and useful citizen; and perhaps the best evidence of his ability is found in his clear perception of the genius of Watt, his steadfast faith in his final triumph, and in the fact that he was able to rise above minor difficulties and struggle on through weary years to a final complete success for both of them.

Among the other trials that had to be borne by the struggling firm were the desperate efforts made to have Watt's patents declared void by the courts or by Parliament. These efforts finally failed, but added much to the burdens under which Boulton & Watt struggled. We find Watt writing to Boulton during this period, as follows:

"They charge us with establishing a monopoly; but if a monopoly, it is one by which their mines are made more productive than ever they were before. Have we not given to them two-thirds of the advantages derivable from its use in the saving of fuel and reserved only one-third to ourselves; though even that has been still further reduced to meet the pressure of the times? They say it is inconvenient for the mining interests to be burdened with the payment of engine dues; just as it is inconvenient for the person who wishes to get at my purse that I should keep my breeches-pocket buttoned. It is doubtless also very inconvenient for the person who wishes to get a slice of the squire's land that there should be a law tying it up by entail. Yet the squire's land has not been so much of his own making as the condensing engine has been of mine. He has only passively inherited his property, while this invention has been the product of my own active labor, and of God knows how much anguish of mind and body!"

There can be no doubt that many of the methods that are to-day followed in machine shops, especially those in which engines are constructed, were first developed in this shop of Boulton & Watt's. Of most of these there is no record; there were no "American Machinists" in those days. But Smiles, in his "Lives of Boulton and Watt," relates how some sal-ammoniac and iron borings had become accidentally mixed in the tool chest of William Murdock and badly rusted his saw blade. Instead of simply seeing to it that that particular combination was not again formed in his tool chest, as most men would have done, he immediately saw the possible usefulness of it: made some experiments and developed the cement which is to-day largely used for bedding engines and making joints of various kinds required in machine construction. Murdock was probably their best man, and, besides being an excellent workman, was himself an inventor. The invention of the D-slide valve is attributed to him, and he also conceived and first carried out the idea of lighting houses by means of gas carried through pipes.

At Handsworth Church, near the house in which Watt lived, Boulton, Watt and Murdock are buried, and here is a magnificent statue of Watt. Previously, on Easter Sunday, I had visited Westminster Abbey and had there seen the statue to Watt, which bears the famous inscription composed by Lord Brougham, and which

is generally considered to be the finest lapidary inscription in the English language. It is printed below. F. J. M.

Not to perpetuate a Name
Which must endure while the Peaceful Arts flourish,
But to show
That Mankind have learned to honour those
Who best deserve their gratitude,
THE KING,
His Ministers, and many of the Nobles
and Commoners of the Realm,
Raised this Monument to

JAMES WATT,

Who directing the Force of an Original Genius
Early exercised in Philosophic Research
To the Improvement of
THE STEAM ENGINE,
Enlarged the Resources of his Country,
Increased the Power of Man,
And rose to an Eminent Place
Among the Illustrious Followers of Science,
And the real Benefactors of the World.
Born at Greenock, 1736.
Died at Heathfield, in Staffordshire, 1819.

▲ ▲ ▲

That Patent Experiment.

BY FRANK RICHARDS.

Those who read my account of "A Patent Experiment," in the "American Machinist," January 27, will doubtless be interested in the following letter. The coincidence of dates is remarkable, and the bland confidence of method displayed is perhaps not less so. The italics are mine. It will be remembered that this firm reported as patentable a patented invention of mine more than thirty years old. This is also the firm which charges 50 cents for a 5-cent copy of a patent "if only the name of the inventor and date of the patent are known":

Mr. F. H. Richards.

Dear Sir:

You wrote us some time ago about a patent, and we have carefully preserved your correspondence, because should another claim the invention it will be good as evidence to prove that you are the first inventor, and alone entitled to the patent. * * * It will, however, be useless for us to keep the correspondence if you do not intend to apply for a patent.

Allow us in this connection to say that we, in the belief that you intended to apply for a patent, *made a careful preliminary examination* and that other attorneys charge $5 for this service. * * *

We will be glad to know your intentions with regard to your invention, and if you will make a small remittance, even if it is not more than $3, as an earnest of your intention to proceed, we will keep your papers on file, and when you are ready to apply for a patent the amount you remit will stand to your credit.

We will be glad to hear from you, and remain, Yours truly,

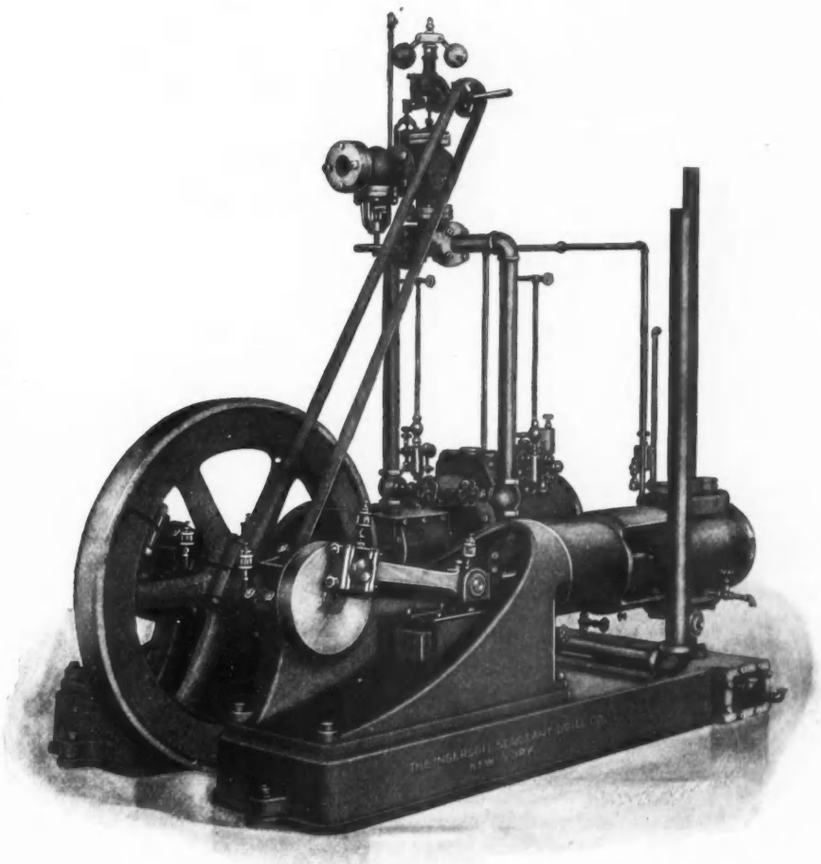
C. A. SNOW & Co.

Washington, D. C., Jan. 27.

Automatic Steam Driven Air Compressors for Shop Service.

We illustrate one of the latest styles of air compressors made by the Ingersoll-Sergeant Drill Company. It has been especially designed for use in shops and factories, where it is now becoming almost imperative to maintain a constant supply of compressed air. The use of the air in shops may be said to be always intermittent and irregular, so that no satisfactory service can be obtained from a constantly running machine. Devices that simply stop the steam driven compressor when the pressure rises to a given point, and start it again when the pressure falls two or three pounds, are open to the serious objection that while they guard against high pressures they do not prevent the compressor from running away when the pressure falls too low. The present machine is reliably automatic in its action against either high or low pressures. A pressure actuated throttle valve takes care of the compressor when the pressure rises to the allowed limit, and the ball governor prevents the machine from running above its permitted speed when the pressure falls.

The machine, as will be seen, is compactly arranged, and is entirely self-contained. The steam cylinders, 8 by 8 inches, connect to cranks set at 90 degrees, so that there is no dead center. The air compression is two-stage, with an effective intercooler between, thus securing the most economical application of the power employed and avoiding the high temperature at delivery, and the possibility, to which attention has recently been called in our columns, of dangerous explosions by ignition. The air compressing cylinders, which are water jacketed, are placed one tandem to each steam cylinder, the smaller or high pressure cylinder being in the view here given, the one near the observer. These cylinders are respectively 14 inches and 9 inches diameter, with the same stroke, 8 inches, as the steam cylinders. The tubulous intercooler is contained in the base of the machine. The normal speed of the machine is 150 revolutions per minute, and the free air capacity is 210 cubic feet per minute. With ordinary steam pressure the air may be carried up to 100 pounds, gage. A line of these compressors is made, with steam cylinders from 6 by 6 inches to 12 by 12 inches, and air cylinders from 6 by 6 inches to 18 by 12 inches with free air capacities from 50 to 1050 cubic feet per minute, and for pressures ranging from 10 to 125 pounds.



AUTOMATIC STEAM ACTUATED TWO STAGE AIR COMPRESSOR FOR SHOP SERVICE.

"Seasoning" Iron and Steel.

I was in the office of my friend Sackson the other day, when the telephone bell rang; he excused himself for a moment and soon I heard him talking to a man whom I knew at once to be about four and half miles away, because Sackson, like most others who do not use the telephone very much, raises his voice in proportion to the distance it has to carry. After the usual amount of apparently senseless repetitions of "yes" and "no" and a round of "jawing" with "central" for cutting him off before he had finished, I heard him say finally: "Yes, we could put on more men and build a machine to look like it in less time; but if the machine must be as accurately constructed as the one you have we would need about the same length of time to build it in. The time in which such a machine can be built to equal the one you have is not a matter of simple arithmetic and you—— Well, all right, I'll be glad to have you come over and I may be able to show you some things that will be interesting."

Sackson "rang off" and came over to me with rather a tired smile on his face, and explained that last year he had built for Smithson a special machine in which the utmost attainable accuracy was required. The top of the bed had to be straight and to be arranged so that it would remain so; there were two spindles, one of which ran at very high speed and was hardened and ground; the other did not run so fast, but its journals were finished by grinding, and it was of vital importance that both spindles should be as nearly round and true as it was possible to make them. "Nobody gets fairly paid for the real cost and value of such work, anyhow," he said, "and Smithson believes I robbed him on the job, when, in fact, I just barely got my money back, dollar for dollar. I wanted him to give me an order for two of them at the time, but he wouldn't, and he finally beat me down to half the price for one that I had offered to build two of them for, though I knew that I ought to have had more than that. Now he wants another one in a hurry and he can't get it. He thinks he can, though, because he has an idea that if I won't promise to complete the machine within the required time he can go over to Jamson's and get it built in any time he has a mind to specify. And he can get Jamson's promise easy enough, so far as that is concerned; but getting the machine will be different, and the cold fact is that Jamson can't build such a machine as I built for Smithson in any time whatever, and for the simple reason that he don't know how. It involves problems which he has never grasped the rudiments of, and he would be ready to deny the existence of any such problems if they were mentioned to him. Smithson is on the way over, and you just wait till he gets here and you'll see how a man looks when he is acquiring some new ideas about machine construction."

Smithson didn't come right away, and before he arrived we had a chance to smoke a little, discuss the growing foreign trade in machine tools and the evident disposition of some of the purblind foreigners to protect themselves against our "pauper-made products." When Smithson came in I noticed that he had the air of a man who thinks he has a trump card, or perhaps the joker up his sleeve, and it soon appeared that the cause of his delay was that he had "thought that, as Jamson's shop was on the way," he might as well stop there and see how he was fixed. "And Jamson says he can build the machine in about one-fourth the time you want to build it in, and besides his price is lower. You know the patterns and drawings belong to me, and Jamson says if I will send them over he will have the patterns in the sand this afternoon, and will hustle the job right through. You built the first machine, and it is all right. I would rather you would build this one too, but you know that time, to say nothing of the difference in price, is very important, and I must do the best I can for myself." "Well," said Sackson, "if putting the pattern in the sand were all there was to it I could do that as quick as anybody, but unfortunately that machine can't be built in the foundry. If it could it might save you and Jamson a good deal of trouble. We will get the patterns down and you can take them with you if you want to; but while we are getting them ready perhaps you would like to take a walk through the shop with me. We are doing some interesting work just now."

We hadn't gone far into the shop before Smithson stopped and fixed his eye on some castings that were over against the wall resting on pieces of two by two pine placed under each end. "Seems to me those are the same castings I saw when I was here two months ago, and you told me they were for those machines you were getting up for Hammerson. They had been roughed out then already, and I should think you would be tired of seeing them there. Why don't you put in more planers, Sackson, and try to make more prompt deliveries?"

"So far as I know there is no one in the machine business that comes nearer fulfilling his contracts in regard to time of delivery than I do," said Sackson. "Those castings are standing there because that is a necessary part of the operation of building machinery of that class. They are seasoning."

It was not necessary for Smithson to say anything. His looks were enough to plainly indicate that he didn't know whether Sackson really meant it or not, and he evidently concluded it was best not to say anything in reply. He is one of those fellows who imagine that if they only avoid asking questions others will imagine they don't need to, and that they know all that anybody else knows.

I saw that Sackson was not through with him, however, and pretty soon we came to a lot of steel spindles. Some of these had been roughed out in the lathe, and were left soft; others had been roughed out and then hardened, but none of them had been finished. They were dusty and had evidently been reposing on that shelf for a long time. Smithson's eyes asked if these were seasoning, too, and Sackson's tongue informed him that they were, and said he: "Here are some milling cutters that are all finished, but they have to season for a while before we can use them."

By this time Smithson was as full of this seasoning racket as he could hold, and his exclamation of impatience seemed to be the signal that Sackson had been waiting for, for he opened fire on him as follows: "When a casting cools off its uneven shrinking sets up internal strains which are finally balanced against each other, so that the casting will, after that, retain its form. The interior portion of a lathe-bed, for instance, may, when the bed has cooled, want to shrink more than the previously cooled upper and lower edges will allow it to do, and the different portions of the casting will be all the while trying to stretch or to compress each other, and the final shape which the casting will take if left to itself is that in which the different forces are balanced. The fight between them is, however, not settled as soon as the casting is cooled by any means, but it continues for a long time afterward and dies very gradually, the form of the casting continuing to change slightly for a long while, in some cases for months. The molecules composing the iron are simply settling into their final places, and it takes them a long while to do it. It is, of course, clear that if we attempt to finish to an absolutely exact surface before this settling operation has been completed we shall simply waste our time and labor, while, on the other hand, if we wait until the casting has ceased to change and then plane off the top of the bed we thereby remove a portion of the forces which are acting within the bed. The top, which has been resisting the further shortening of the bed, is cut away. The bottom portion, which is also resisting the shortening process, is less able to do so, and the central portion, finding less resistance on one side, contracts on that side, with the result that the bed is slightly curved; a new set of forces is put into action, and a large part of the original settling operation must be gone through with again before the casting can take a form which will be permanent. This process will require all the way from one to six months, de-

pending upon how much strain there was in the casting originally and somewhat also upon the nature of the iron.

"We, therefore, when we want to get the best possible results—when we want to know that a surface, once scraped exactly true and straight, will remain so—plane off the roughing cut as soon as possible, so that practically all the metal that is liable to take part in the struggle, and that must eventually be removed, is gotten out of the way at once, and the settling that then takes place is the final and permanent one, after which we finish by light cuts and scraping.

"With these spindles it is much the same. We used to have a good deal of trouble with them. They must run in accurately fitted bearings at very high speed, and we used to find that after we had ground them as true as we possibly could, there would often be trouble, and when we would take the spindle out and test it, it would invariably be found slightly out of true. A friend of mine who makes large wood-planers helped me out of this difficulty by telling me one day that he had found it necessary to rough out the cylinders for such machines in the lathe, plane them for the seats for the blades, drill and tap them and then stand them on end on the shop floor for at least a month (and he lets them stand longer, if possible) before finishing them. Only by thus letting them rest after roughing out could he make a journal on them that would stay true. I took the hint and tried the plan on these spindles with perfect success.

"In the case of these spindles it is strains that are set up during the forging process and the subsequent cooling that cause the trouble. One side may be hammered when it is a little cooler than the other, and local internal strains are set up. Thorough annealing will help it some, but does not entirely remove the trouble. If the piece has finally settled down as a result of an armistice between the various forces and you then remove one or more of them by taking off a considerable cut in the lathe or planer the remaining forces have to settle things on a new basis. They approach closely to this new basis right away, but it usually takes them quite a while to come to an exact agreement, so that absolutely no further changes will take place. This being the fact it is at once seen that the best practical plan is to remove at first the bulk of all the metal that is to come off, set the piece aside and give it time to settle its differences in its own way and take its permanent shape. Then it can be finished by grinding and will remain true.

"Well, unfortunately, Smithson, your opinion about this being nothing but fine-haired theory and all that don't help us a particle in overcoming the difficulty. If a carpenter builds a hen-coop he need not pay so very much attention to the question of what shrinkage will take place in the wood after it is built. Hens are not critical in such matters. But when a cabinetmaker does a very fine piece of work he must know what the wood is likely to do and must arrange to prevent it from doing things that will spoil the job.

"We who work in iron and steel must know the nature of the materials we work with if we are to do work of the highest possible quality. In the construction of wheel-barrows, threshing machines or horse-pokes these fine points can and must be ignored; but when trying to do the best possible work they must be understood and provided for or failure is inevitable.

"No, these cutters do not give trouble in precisely the same way, but they give trouble from the same cause. When a piece of steel is heated red hot and plunged into cold water tremendous strains are set up within it; the outer portions are cooled instantly and, of course, shrink, the still red-hot interior portions yielding to allow this. But when it comes to the turn of the interior portions of the piece to cool and shrink they find the previously hardened outer portions ready to resist this shrinkage, and the result is that stresses are set up within the piece that it gradually yields to, as in the case of these spindles; or sometimes it yields all at once, and the piece breaks or cracks soon after its removal from the water. We find by experience that if these cutters, which, as you see, are necessarily rather weak in form, are put to work at once after being hardened they are very apt indeed to break immediately; while, if we make up a lot in advance and let them lie on that shelf for a month or so before using them, there is seldom any trouble.

"The cams which these cutters are used for grooving show evidences of the same action. They are made of machinery steel, are about 6 inches in diameter and 8 inches long. We case harden them and afterward fit a shaft to the 2½-inch hole which passes through them. Experience shows us that if we fit this shaft immediately after hardening we do it at the risk of having to do the job over again, for the shaft will often be found loose the next morning. We wait two or three days, and by that time the cams seem to be sufficiently settled to insure the permanency of the fit, although I have not the least doubt that if circumstances demanded it and we should apply a more refined test to them, we should find slight changes going on for a month or more.

"Now, Smithson, you see some of the reasons why I will not promise to build you a second machine to meet the same requirements as were met by the first one and do it in less than one-fourth of the time. Perhaps Jamson knows how to overcome these difficulties, but I confess I do not; and, to be candid about it, I do not believe Jamson even knows that such difficulties exist. If he does not, then it is for you to say whether there may not be other points about the construction of such a machine that have escaped his notice also."

Smithson left the patterns and an order to build two of the machines which Sackson said he could build just as quickly as he could one of them, and after Smithson had gone Sackson told me there was one thing he had heard of that might prove to be a means of shortening the time, but he wasn't going to tell Smithson about it until he had tried it and knew. "The plan is," said he, "to apply heat to the pieces. It has been found by those who make fine straight-edges that by carefully drawing them to a straw color after they have been finished, except for the final lapping of the edges, they do not need to season nearly so long. That degree of heat seems, by forcing the molecules of steel to move upon one another, to facilitate the operation of their final adjustment. I think my core oven will just about take in one of the beds for Smithson's machine, and if it will I shall bake those beds after they have been roughed out, and by allowing them to cool slowly before I take them out of the oven I expect that they will settle down very much sooner. And it won't hurt the spindles to be drawn to a straw color and will probably hasten their settling down to business too."

I came away feeling as though it would be no more than right if Sackson should render an extra bill for his lecture delivered to Smithson. Smithson builds machines of another description himself, and the lecture is undoubtedly worth to him any reasonable amount that Sackson might charge for it. But I suppose there would be a kick at the bill, and, any way, Sackson ought to make a little money on this order because he has two of the machines to build together, instead of one, and this doubling of the order was undoubtedly the direct result of Sackson's lecture.

FAY.

▲ ▲ ▲

Disbarment of Patent Attorneys.

It is officially announced that Rensselaer C. Howard, Jersey City, N. J., A. C. Woodruff, Oakland City, Ind., and W. H. Pender, Washington, D. C., will not hereafter be recognized as attorneys or allowed to conduct business with the Patent Office.

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A correspondent (who, luckily for him, is at a safe distance), referring to Mr. Halsey's articles on worm gearing, asks us why we are so much interested in angle worms at a time of year when fish don't bite?

Letters from Practical Men.

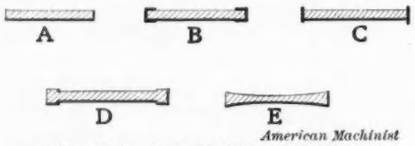
T-Square Blades.—Vertical Drawing Boards.

Editor American Machinist:

If the designer of a printing press desires to spread a small quantity of ink over a large surface he conceives another large surface, bends it in the shape of a cylinder and rolls the one across the other with a view to bringing every part of each surface into occasional contact.

A similar idea appears to govern the use of lead and other laps.

Similarly, if you wish to smear a sheet of paper with graphite, fasten the paper down on a smooth board, apply soft lead pencil and rub another board or other flat surface on the paper, and occasionally add graphite or plumbago, as required.



American Machinist

SECTION OF T-SQUARE BLADES.

A common T-square and a very common, every-day sort of drawing board will work like a charm in this way. If you do not care to soil the T-square you can obtain a good substitute in a set-square, the longer the better.

Of course in making a drawing you may not desire to smear the paper, though the combination of flat surfaces and lead pencil works naturally to that end; and, although the manufacturers of drafting instruments appear to be among the most conservative of men, I venture to suggest, in the hope that it may be worth adoption, that the surfaces in contact be limited in area, as see Fig. 1. *a* represents the common form of T-square blade in section. By adding a metal strip to each edge, as at *b* and *c*, the blade is slightly raised from the paper. The blade may be constructed in one piece, as at *d* and *e*.

In the case of set-squares a support may be arranged by adding three small disks of celluloid or horn to each side.

Lathes, milling machines, drills and other tools are carefully designed to permit the operator to attend to the work under way with least bodily strain; the workman directs and guides rather than pushes or drags, and it is not an essential feature that the workman shall have exceptional bodily strength. In fact, machinery generally is arranged to be handled with least personal inconvenience.

If a firm commenced the manufacture of milling machines, and designed them so that the levers were not more than twelve inches from the ground, I can well imagine the position of the operator who should use them if, by any possibility, they came to be used at all. The average draftsman crooks considerably over a drawing board but slightly inclined. May not these angles be exchanged with advantage?

What vital objection can be shown against the drawing board being placed about as near a perpendicular position as it now approaches a horizontal one?

It may be objected that it would be inconvenient to reach all parts of a large board even then, and, furthermore, the board would not be so handy to place instruments upon.

The T-square can be attached to the board and both T-square and board balanced by counterweights; the placing of instruments on the board is convenient, but open to objection; a ledge at lower edge of board would meet the requirements.

Perhaps difficulty would be met in using ink, but this is a question to be settled by practice, and as a clinching argument in favor of this position of the board notice the gentlemen at work in the department of illustration, as shown in the article on the equipment of the "American Machinist." R. I. C.

Providence, R. I.

[Can it be possible that drawing boards nearly vertical are entirely unknown in Providence? Such boards are frequently met with elsewhere, and those who use them say there is no trouble with flow of ink. But if there were the fact remains that most drawings are practically finished when ready for inking, and if need be they could be brought down to near a horizontal position for that.—ED.]

▲ ▲ ▲

Experience with Roller Bearings.

Editor American Machinist:

After reading the letter from F. F. S. in your issue of January 6, 1898, it occurred to me that your readers might be interested in the roller bearings which were put in the Wm. L. Gilbert Clock Company's works in the early part of 1895. The writer does not know it for a fact, but believes that this company was the first large one in the United States to entirely equip its main lines and part of its countershafts with modern roller bearings. The building so equipped is 150 feet long with three stories and basement, and in it are manufactured the clock movements. As stated in your editorial October 17, 1895, and in a letter from Mr. Geo. B. Woodruff and the writer in an earlier issue of the same year, the water wheel was not large enough to furnish the power required, and as we could not stop to put in a larger one we concluded to try the Hyatt roller bearings, which have been running every working day since, and a number of them have run twenty-four hours per day for five or six months in this period. Some of the first boxes put in had cast-iron shells, which were replaced after running a few months with steel cases. These cast-iron boxes were not worn out, but were replaced by the manufacturers. The plant is an old one, having iron shafting which was worn at the bearings by the babbitted boxes before the change was made. We frequently examine these bearings for wear, and while we have not made any actual measurements, I am certain that there has been no perceptible wear. We have several times had trouble from these bearings, and have been compelled to replace them with the old babbitt bearings, but through no fault of the roller bearings; the trouble being that, the shafting being old and worn, it was larger in diameter at one end of some bearings than at the other, causing an undue twisting on the cages, breaking them and allowing the rollers to get twisted so they failed to revolve. Our line shaft is 1 15-16 inch in diameter, and runs 225 revolutions per minute. We have one counter same size, which has three bearings, and it runs 360 revolutions per minute. This piece was new when started with bearings and is practically in the same condition now as then. There is only one fault, and that is, the low rumbling noise caused by the rollers revolving at a high speed within a hollow steel case. This, I believe, can be almost entirely stopped where shafting is round, by placing felt or other non-conductors of sound between hangers and timbers that they are bolted to. Those managers who wish to save on their coal bills would never hear it.

We have something over 104 of the bearings in use on over 600 feet of line shafting, and with my experience will frankly state that, instead of using less, I will, as occasion arises, use more. I know of a certain superintendent who would not put them in his new building and on new shafting because ours make a little noise. His plant is a machine shop. We have about seventy-five girls working in one room and they never complain of noise; in fact, no one in our plant notices it. If we were burning coal and had no money to burn, we would say, "go on rumble."

THOS. W. R. MCCABE,
Master Mechanic.

▲ ▲ ▲

A Die and Die Holder.

Editor American Machinist:

I send drawing of a die and die holder intended chiefly for making small screws on the screw machine.

The die (Figs. 1, 2, 3 and 4) is composed of three chasers, which are cut from a hollow cylinder of steel, divided in three parts. Figs. 3 and 4 show two sections of one of these chasers. The three chasers are held firmly on the die holder by a clamp collar, as shown in Figs. 1 and 2. Each chaser has a hole in which fits a stud *g* projecting from the die holder. In this way it is easily fast-

ened and held. This die can be easily made and ground when dull. It can be fastened on any die holder of the catch and release principle ending in a hollow cylinder. If delicate adjustments are required, also, the cylindrical part of the die holder can be split in three parts lengthwise.

The die and tap holder I use mainly in my shop for the screw machine is shown in Figs. 1, 2, 5 and 6. To an arbor *a* is connected by a pin a cam *b* having four catches, two on each side (although one only would be sufficient), which can be engaged and released from other catches projecting from two pieces, *c* and *d*, which are rigidly connected together by a sleeve outside.

The part *d* ends in a hollow cylinder, to which the die is fastened. It is fastened to the sleeve by two screws, *h*, and can be easily removed. The parts *c* and *d* can slide on the arbor *a*, which is held in the turret hole. The action of the die holder is evident, and does not differ from the other die holders generally in use.

Figs. 7 and 8 show another die and tap holder, which is nearly the same, but has the arbor sliding and holding the die or tap, the other parts being held firmly by the turret clamp.

CAMILLO OLIVETTI.

Torino, Italy.

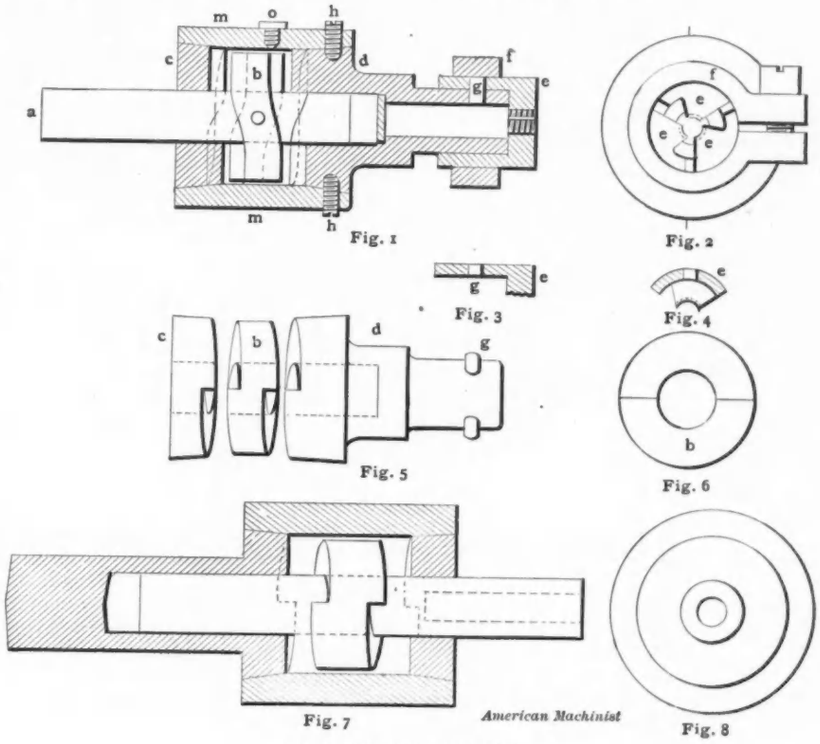


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6 Fig. 7 Fig. 8

DIE AND DIE HOLDER.

▲ ▲ ▲

That Practical Problem.

Editor American Machinist:

In response to J. Calhoun's inquiry in your issue of January 6 for a practical and economical method of producing disks, as shown by this sketch, please find inclosed sketches which, it is hoped, will be of some benefit to him. He does not mention material used, and this, of course, leaves a question as to the proper method to be employed, but, assuming that machinery steel is used, I would suggest to him the following as a cheap way of doing the work:

The disks would be drop-forged 2 5-16 inches diameter by 9-16 inch thick, with a center mark for starting the drill. It would then be best to remove the scale from the sides of the forging on an emery wheel. A small universal chuck attached to the drill table would serve for holding the work for drilling. Make a special drill, as shown in Fig. 1, which will drill and ream the work at one setting.

After the drilling process our old friend the engine lathe would come into play. Referring to Fig. 2 *A* is the main spindle, into which is fitted arbor *B*, being bored slightly tapering and split at the outer end to allow for expansion when pilot *C* is forced into it; pilot *C* taking its bearing in sleeve fitted into taper hole in tailstock arbor *D*. This device would make a rigid drive and would prevent the use of troublesome mandrels and dogs. By withdrawing tailstock arbor the work could be readily slipped off by hand. Secured to the regular tool block is holder *E*, into which is securely clamped a right and a left hand siding tool for finishing the sides and a "round-nose" for finishing the face. A caliper gage, such as shown in Fig. 3, would be handy for determining the diameter and width of work. A tool-steel jig, as shown in Fig. 4, is all that is required for locating the small hole properly. Fig. 5 represents the stamping device, which also is applied to the lathe. *A* is the main spindle, and *C* is the chuck for holding the work. This chuck being a pinion of 27 teeth, 12 pitch, on one side of which is a taper shank fitted into the spindle, and the other side is reduced to ¾ inch to fit the

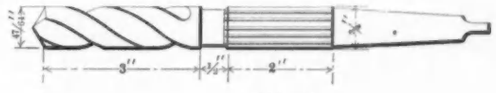


Fig. 1

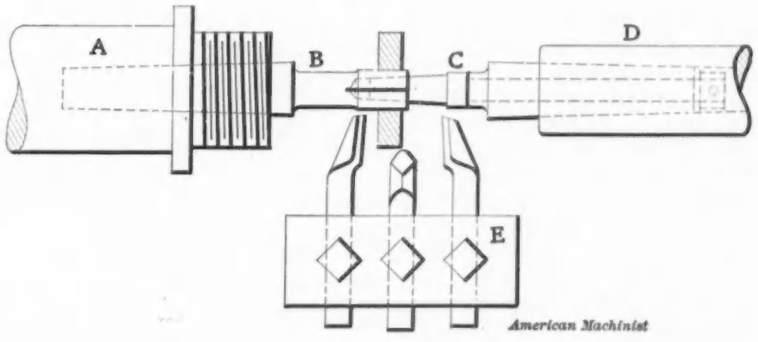


Fig. 2

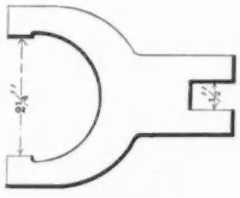


Fig. 3

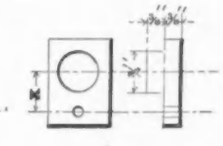
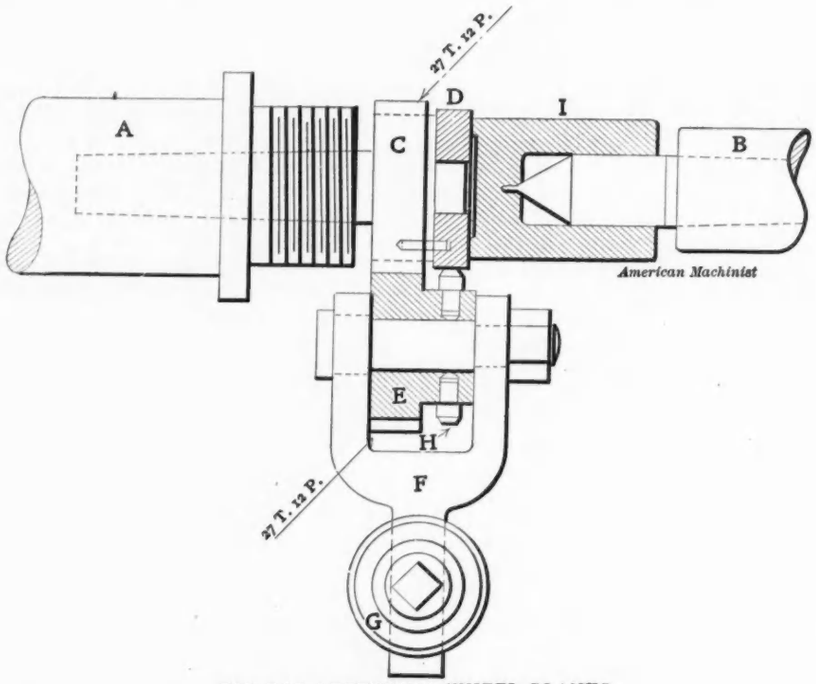


Fig. 4

FOR DRILLING, TURNING AND GAGING WHEEL BLANKS.

hole in the work. The small pin fits into the hole in the side of the disk, and also acts as a driver. *B* is the tailstock arbor and center. Fitted loosely to the tailstock center is the sleeve *I*, which is brought against the work to keep it in place. This will avoid the bother of taking off a nut each time. *G* represents the tool-post, clamping the holder *F*, which has a stud passing through it to



RIG FOR LETTERING WHEEL BLANKS.

form a bearing for pinion *E*, also of 27 teeth, 12 pitch. This pinion has a hub projecting on one side, and into this hub the ten letter stamps are fitted. These stamps may be made from the ordinary steel stamps, annealed and convexed slightly in order to make them roll nicely on the work. The stamping roller must of course measure the same from face to face of letters as the disk, 2¼ inches across. There could be a stop placed on the cross slide of the carriage, one on either side of rest, which would on one side keep from stamping too deep and on the other prevent the gears from coming out of mesh and losing the relation of the pin hole with a certain letter. That, I presume, is important.

W. L. SCHELLENBACH.

[The above tells more than Mr. Calhoun's letter calls for, as he only wished to know how to stamp the letters and the blanks after they were turned and drilled; but as a good example of a thoroughly thought out and concisely stated job we take pleasure in reproducing it entire. Mr. Calhoun's disks were to be of cast iron, which fact being stated in a separate communication did not get into his letter.

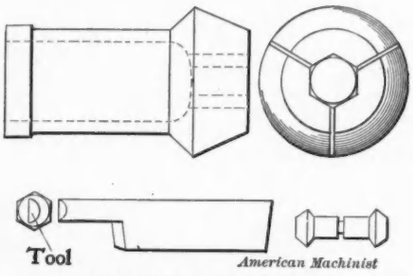
We have received a number of other plans for doing this job, but lack of space prevents the presentation of all of them. We, therefore, give above the one which, all things considered, seems to be the best one received.—ED.]

▲ ▲ ▲

Slotting in the Lathe.

Editor American Machinist:

The article by your correspondent, John Randol, on the use of the lathe as a slotting machine, tempts me to send you another example. In the making of the spring collets or chucks for the screw machine, for holding square, hexagon, octagon or other straight sided stock, some tool-makers make the shaped hole first and turn on a mandrel of the same shape. If they turn two collets on one piece, inside ends together, then steady rest them and bore hole the size of the



SLOTTING IN THE LATHE.

smallest diameter of hexagon or other shape, they can be slotted out, as Mr. Randol's tool-maker was doing to perfection. Lay out the shape and size of hole on surface of any old piece of sheet steel or tin, and make tool the width of side, and as heavy as possible for the size hole you are making. Then cut apart after slotting the ends, and bore out the back end in steady rest or in chuck.

Another pointer for your young readers is, always have handy and use a tool or other piece of iron or steel clamped to your lathe bed for a stop, when boring holes which do not extend through the piece in the lathe; or have shoulders in them. It is much neater, easier and safer than those nicks filed on your boring tools, which look like the tallies of the scores of baseball games we kept when boys.

GUY.

▲ ▲ ▲

Electrical Distribution of Power.

Editor American Machinist:

In his article on "Electrical Distribution of Power," Mr. Webber shows the loss of power in transmission by belts and shafting, but does not show the loss in transmission by electricity. He should also charge electrical transmission with part of the loss by belting, because it is very seldom practicable to have a motor for each machine.

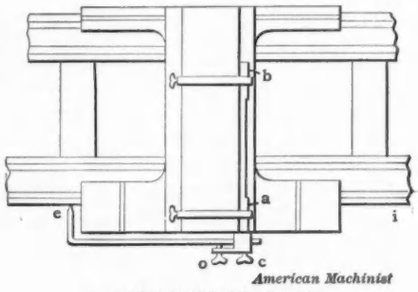
X.

▲ ▲ ▲

A Squaring-Up Gage.

Editor American Machinist:

I send you a sketch of a gage that I saw in use at the Bradford Mill Company's shops, this city. It can be used as shown for squaring a lathe carriage or any other similar work. Of course, it is a great help to know that a carriage is dead square before it is tested by taking a cut across the face plate, which is generally the way of testing a lathe for straight facing; for if it should be found to be out of square then it would have to



A SQUARING-UP GAGE.

be taken off and scraped around, which would make a great amount of extra work. Someone may say, have the carriages planed square. But a good planer hand can well say that he has done his best when he has got within one or two thousandths of an inch. The work is liable to shift or give a little in working at it on the planer, although he may not know how it does so.

The spindle is turned true and exactly the same size at *a* and *b*. The clamps hold it in place in the acute angle of the rest, but not so tight as to prevent its turning. The needle passes through a hole in the head and is fastened by the screw *c*. The screw *o* gives a firm adjustment to the point by springing the

needle a little. The head is kept against the rest, and the needle is swung back and forth from *e* to *i*, and when it touches alike at both points the slide of the rest must be square. This gage, I think, is in some places better than a square, because in using a square, if the blade touches at its outer end first, it is likely to give a little.

H. L. C.

Cincinnati.

▲ ▲ ▲

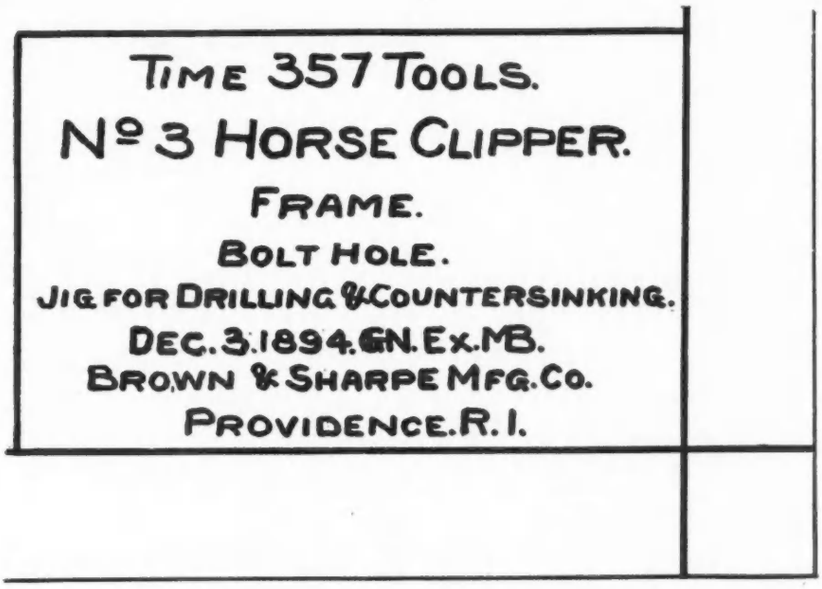
A Lettering Stick.

At a recent visit to the works of the Brown & Sharpe Manufacturing Company we were shown a novel instrument used

LETTERING STICK.

in their drawing office in place of a pen for making titles and for all other lettering on drawings. It has been referred to in our columns before, but will bear description more at length. They call it a lettering stick. Its form will be seen in the accompanying half-tone, and its general appearance, as well as the figures upon it, will show that it is home-made with a penknife from the remains of an old triangular boxwood draftsman's scale. The chief advantage of it is that it will not make hair lines, all letters and figures made by it being necessarily black and strong, insuring clear prints. With it we give a slightly reduced photo reproduction of a title to a drawing, which shows the character of the work done by the stick, as well as the regular form of title used at the B. & S. works for shop tool drawings.

It should be added that after use in a long job of lettering the ink will soften the point of the stick, to provide for which each draftsman has two of them. When one becomes softened it is laid aside and allowed to dry while the other is used.



ARRANGEMENT OF TITLE FOR A TOOL DRAWING.

▲ ▲ ▲

Liquefied Air.

Perhaps the most striking exhibition of liquefied air and its properties which has yet been made was given by Professor Barker in his laboratory at the University of Pennsylvania on January 27. A graphic report from which we draw was given in the Philadelphia "Ledger" of the following day.

The air used was liquefied in New York at the laboratory of Mr. Charles E. Tripler, two and a half gallons of it being conveyed to Philadelphia in a milk can thickly covered with felt. In the process employed for liquefying the air it is compressed to a pressure of 2,000 pounds and cooled by passing through a copper coil to normal temperature. It is discharged through a very minute opening, when it expands, and its temperature falls, and, coming in contact with a second coil, cools that and its contained air at 2,000 pounds pressure. This cooled air is discharged also upon a third coil, also containing air at the high pressure, and in this coil the cold produced is so intense that the air runs out in a liquid stream a quarter of an inch or so in diameter.

The liquid air remains liquid, just as water does, until its temperature rises to the boiling point, and then, as the operation of evaporation requires heat for its maintenance, the evaporation proceeds slowly or rapidly, according to the rate of heat supply. The intensely low temperature must, of course, not be forgotten. Ice dropped into the liquid causes it to boil until the ice is cooled. The boiling point at ordinary atmospheric pressure is—191° Centigrade or—320° Fahr. As the boiling point of nitrogen is more than 10° below that of oxygen, it is found that it boils out first, and by a careful control of the evaporation the liquid oxygen may be retained separate; this process, therefore, affording a means of obtaining oxygen for the many purposes for which it is required in the arts.

The refrigerative phenomena exhibited were numerous and interesting. An egg placed in a tumbler of the liquid caused it to boil furiously. When the egg was finally "cooked," or cooled to the temperature of the air, it was taken out and struck with a hammer, flying into the finest fragments! Tin became as brittle as glass, while copper and platinum were not affected in this way. Mercury was frozen so that it was used to drive a nail in a board. Cotton saturated with the liquid oxygen exploded and burned brilliantly. These phenomena and others exhibited too numerous to be rehearsed here suggest great possibilities of usefulness for liquid air in the future.

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Soldering Aluminum.

Many of our readers who have been defeated in their attempts at soldering aluminum will be interested in the following, which we gather from the specifications of two patents recently issued to Frank A. Gooch, of New Haven, Conn.

It is difficult to solder aluminum either to another piece of the same metal or to any other metal. This is chiefly due to the presence of a thin film of oxid of aluminum which prevents a close and intimate contact with the solder when in a state of fusion. This film is refractory and not usually dissolved by the ordinary fluxes. Metallic fluorids in a state of fusion dissolve aluminum oxid more or less freely, but they are mostly unsuitable for soldering purposes, because their melting points are too high. It is found, however, that mixtures of metallic fluorids with other suitable substances may be made which are easily melted and will clean the aluminum surface and protect it from atmospheric oxidation. A mixture which has been found useful consists of aluminum fluorid (Al_2F_6), itself not fusible ordinarily, with the easily fusible chlorid of aluminum and sodium ($Na_2Al_2Cl_8$). A mixture of the fluorid of aluminum and sodium (cryolite) with the more easily fusible chlorid of aluminum and sodium is excellent for the purpose and cheaper. The mixture is used by melting it upon the surface to be soldered, and at the same time or subsequently also melting the solder, which may be any of the so-called "lead" solders, or any solder capable of making a firm joint with the aluminum. While the solder is in a state of fusion the two pieces may be brought together and a firm joint will be formed. The two

pieces may also be first clamped in position and the mixture thinly spread along the joint, then the mixture being heated to the melting point, the solder is melted upon it in the ordinary way by blow-pipe, Bunsen burner, soldering iron or otherwise. The fluxing mixture is prepared in the form of sticks covered with paraffin or other easily fusible material.

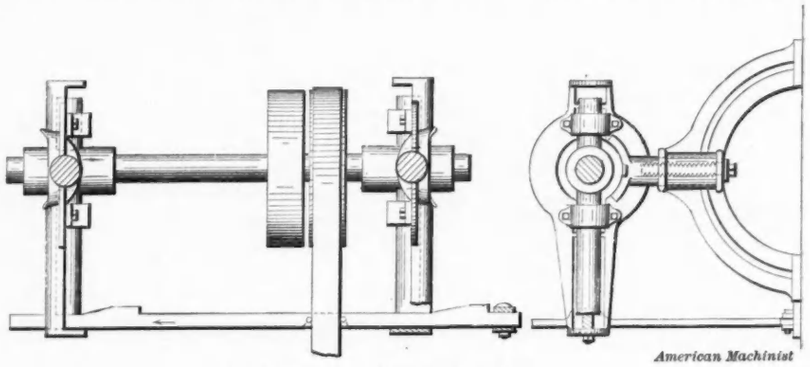
The fluxing mixture as more minutely described is prepared by melting together fluorid of aluminum, fluorid of sodium and anhydrous zinc chlorid. The best results are obtained by using the mineral cryolite with the anhydrous zinc in the ratio of 15 to 25. In the use of the mixtures containing the zinc chlorid the surface of the aluminum is cleaned and protected from atmospheric oxidation, while the zinc is reduced from the zinc chlorid by the action of aluminum and alloys the surface of the aluminum. Should any other metal or alloy capable of combining with the aluminum be present in the solder during the fusion of the fluxing mixture containing the reducible zinc chlorid or be fused subsequently upon the surface of the metal prepared and protected by the fusion of the fluxing mixture containing the zinc chlorid, such metal or alloy will, if it is capable of such union, be united directly with the alloy of zinc and aluminum, and so with the aluminum. In this manner certain metals or alloys which do not adhere strongly to aluminum directly may be made to adhere by the intervention of the metallic coating or alloy produced by the metal reduced from the fluxing mixture. The so-called "lead" solders, for example, do not unite readily or make strong joints with aluminum; but it has been found possible to secure the adhesion of such solders—as, for example, ordinary plumbers' solder—to aluminum by applying them to a surface of aluminum prepared by treatment with the above-mentioned mixtures containing the fluorid of a metal not reducible from such fluorid by aluminum and the chlorid of zinc.

▲ ▲ ▲

A Combined Belt Shipper and Tightener.

Where tight and loose pulleys are employed, and, especially for wood-working machinery, there seems to be no satisfactory, all-round substitute for them. It is quite desirable to relieve the tension of the belt when running on the loose pulley. If this is not done the pulley is very likely to soon demand it by squeaking or grumbling. A device often employed is to make the loose pulley considerably smaller in diameter than the tight one. An objection to this is that when the belt is thrown upon the tight pulley the machine is apt to be started more suddenly than is desirable, and the edges of the belt are soon stretched out and injured by the climbing.

The device here illustrated gives more relief to the belt than it is possible to get from the permissible difference in pulley diameters, and the act of shipping the belt applies or releases the belt tension at the same time. The edges of the belt also do not suffer as much even as



BELT TIGHTENING HANGER.

where the usual pulleys of equal diameters are used without this change of tension. The action of the device needs little explanation. The usual hanger box is made with two long trunnions, which serve as guides for the lateral movement of the box, and the familiar hanger yoke is modified in form to receive these trunnions, two cups, secured by cap screws, providing loose fitting holes for guides. The belt shipper bar has two wedges made upon it at the required positions, and when the bar slides to ship the belt the wedges strike the hanger-box trunnions and push both the boxes, and the shaft which they carry, sidewise, thus tightening the belt as required. When the belt is thrown to the loose pulley the wedges are also withdrawn, and the return lateral movement of the shaft leaves the belt slack again.

This device is the invention of Mr. Frederick Wiard, Batavia, N. Y., superintendent of the Ward Plow Company. One of the hangers has been in use in that establishment for a year, giving general satisfaction. The lateral movement of the shaft is 1 inch, or equal to 2 inches of belt elongation.

▲ ▲ ▲

The Oil Swindle.

We continue to receive numbers of propositions of the various oil companies in Cleveland, Ohio, offering barrels and half barrels of oil at reduced prices, which propositions, as a result of our exposure, are recognized by our readers as part of a swindling game and are promptly mailed to us. As a recent instance of this kind we have a letter from Mr. Arthur F. Whitin, treasurer of the Whitinsville Spinning Ring Company, inclosing a letter from the Planet Oil Company of Cleveland, Ohio, offering to dispose of a half barrel of "Planet cylinder oil" "near you" at the very low price of "23 cents per gallon," and the oil is "guaranteed to be equal to any cylinder oil in the market." Mr. Whitin recognized the game, but out of curiosity sent for a sample of this oil, and when it came submitted it to an oil expert, who advised him that the market price for such oil was from 10 to 15 cents per gallon. The moral of this, as we have pointed out before, is: Do not buy that half barrel of oil that has been shipped to a point "near you" and which is offered at a low rate "to save the expense of freight back to Cleveland."

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A Main Bearing Construction.

The cut herewith, which we find in "The Engineer," London, shows a main bearing deserving a passing notice. It is

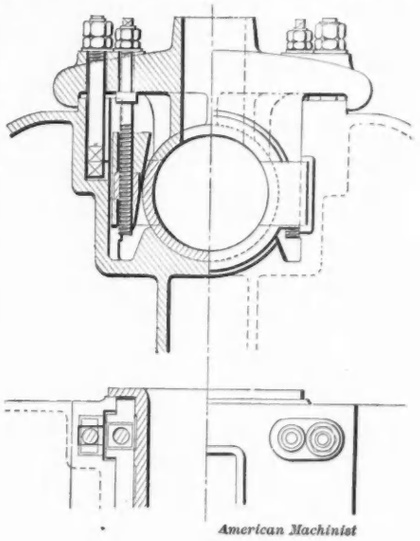

Fig. 1

MAIN BEARING

from a 1,600 horse-power, four-cylinder, horizontal, triple expansion engine, the journal being 16½x30 inches. It will be seen that the bottom brass may be changed without taking the shaft out, a desirable feature which has been accomplished in various ways, usually by slipping out endwise. No top brass is used in this case, the weight of the shaft being sufficient to always keep it down.

The Breaking Off of a Cast-Iron Projection.

BY LAWFORD H. FRY.

In the issue of January 13 Mr. Moore set forth some facts regarding the fracturing of cast iron which certainly appear paradoxical. He showed that a cast-iron projection in being broken off from the main mass does not always break off across its smallest section, but often across one which is larger and hence apparently stronger; just how the fracture will take place depending not only on the section to be fractured, but also on the general shape of the projection.

Our experience teaches us that this is so, and yet what about our rules of design which tell us that a fracture always occurs across the weakest section subjected to the strain causing the break?

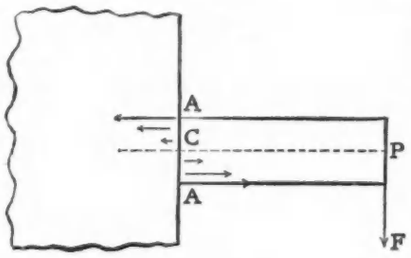

Fig. 1

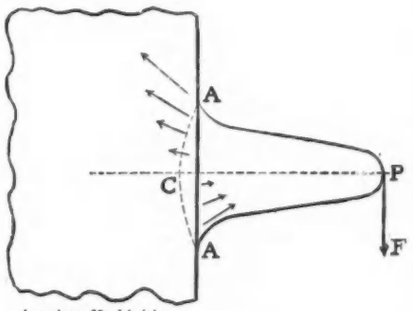

Fig. 2

BREAKING OFF A CAST-IRON PROJECTION.

A simple application of the well-known principle of the lever will show that the further we get away from the point of application of the force the greater becomes the strain due to the bending action of the force; the strain at any section being determined by the bending moment of the force about that section, that is to say, by the product of force × distance of force from section.

Let us now consider the state of affairs pictured in Fig. 1. This is the representation of a projection coming out perpendicularly from the main surface, and acted on at its extremity *P* by a certain force, *F*. Now, if the force be made large enough the projection will break off, and Mr. Moore and our experience teach us that the fracture will occur across the section *AA*.

In the case of cast iron its power of resisting tension is very much less than its power of resisting compression, consequently when the force *F* brings the strain up to breaking point, the first beginning of the fracture will be in the fibers along the top of the section *AA*.

Once started, the fracture will rapidly continue and the projection will tear off along the line *AA*.

We are now ready to turn our attention to the fracture of a filleted form of projection. Let Fig. 2 picture this for us. As before, the bending moment will increase with an increase of distance from the force. In the present case the area of section also increases with an increase of distance from the force, and we are unable from a mere examination of a rough sketch to say just where the fracture will occur, for we do not know just which will increase most rapidly, the bending moment with its tendency to fracture, or the sectional area with its power of resisting fracture. Let us suppose it to be the former, so that the fracture will take place just where the projection comes out from the main casting. The fracture must start in the top outside fibers, and must take place perpendicularly to the pull in them. The direction of this pull must be the direction of the fibers, that is, the direction of the outside of the projection. Hence the fracture starts in perpendicularly to the outer surface of the projection, and consequently, in the present case, not parallel to the main surface of the casting. The first fibers being broken through, the bending moment sets itself to the fracture of the next, and these must also give way at right angles, and we find the fracture following the dotted line in the figure. The small arrows are to represent the relative size and direction of the fiber strains which prevent the breaking off of the projection. The fracture, when it occurs, will then run at right angles to these.

An examination of the forms of fracture given by Mr. Moore will show that they conform very closely to the form we should expect by an application of the theory set forth in this article.

▲ ▲ ▲

Mackintosh, Hemphill & Co., founders and machinists, Pittsburg, Pa., eight months ago increased the working hours from nine to ten without an advance of wages. Recently the nine-hour day was resumed.

▲ ▲ ▲

The builder of the "Alabama," John Laird, died at Birkenhead, England, on the 24th ult., and the roller boat builder, M. Bazin, of Paris, is also dead.

Technical Books.

MECHANICAL DRAFT. B. F. Sturtevant Company. 377 7x9 inch pages, with 108 illustrations.

This is another specimen of high-class trade literature of which we have had occasion to notice so many of late. While put out as a catalog it is, in fact, a much-needed treatise on a subject which has but little literature.

The book opens with chapters on the properties of water and steam, and continues with the theory of combustion and fuels. Following this come the efficiency of steam boilers, including the influence of mechanical draft on efficiency; rate of combustion, including the economy of high rates of combustion; draft, with its cost, measurement and relation to the rate of combustion; chimney draft, including the design and efficiency of chimneys; mechanical draft in its various methods of application. Up to this point there is very little in the way of special pleading for mechanical draft; but the next chapter, under the title "Advantages of Mechanical Draft," considers the points of controllability, independence of climatic conditions, efficiency, adaptability to the burning of cheap fuels, smoke prevention, economy in first cost, etc. Following this comes a chapter describing the different types of Sturtevant blowers, with their adaptability to the production of mechanical draft, while the concluding chapter gives illustrations and particulars of a large number of actual plants.

The subject is a live one, and the book will meet a want which many have felt.

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THE PNEUMATIC DESPATCH TUBE SYSTEM OF THE BATCHELLER PNEUMATIC TUBE COMPANY. By B. C. Batcheller, 147 7x9¼-inch pages with 50 illustrations. J. B. Lippincott Company.

This is the only treatise on its subject with which we are acquainted, and is a piece of trade literature of the best class. Its main object is, of course, to present the Batcheller system to the public, but it is of much greater value than this, being in fact a general treatise on the subject as well as a presentation of the history and present status of pneumatic tube construction, and, as such, is well worthy of a place in the library of any engineer. It is finely illustrated with excellent halftones and line engravings, showing every important detail of the apparatus, while the principles to be observed in laying out and the calculations necessary in designing a tube system are explained in detail.

The book is published, we believe, for gratuitous distribution, though we imagine that some discrimination will be used as to those to whom it is sent.

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Independent Metrical Promotion.

Every civilized nation to-day is worried perhaps most of all about disposing of its excess of products over its needs or means of using. Each civilized nation is scheming to stick its surplus upon some other civilized nation, and so far as it succeeds, or has prospect of succeeding, it is disposed to congratulate itself and to boast of its success. Our most fervent hopes and efforts with the uncivilized and the benighted is that we may so develop their habits as to make better customers of them. The policy is essentially a temporizing one, and fails to bring any nearer the prospect of a permanent and satisfactory solution of the problem of modern industry. That is one of the problems which are too large for the conscious and formulated wisdom of man, but which the push and instinct of the race, slowly, and by movements so broad as to be invisible from any individual standpoint, inevitably work out for its betterment.

Although the policy of seeking foreign markets is thus necessarily a temporizing one, and one which when fully successful all around must still leave us where we were, it is not perhaps for the time to be altogether condemned or avoided. It is the best that we know to do to-day, and it is for us to do it to our utmost. So far as we find, and astonish ourselves a little to find, that we are able to hold our own, and a little more, in the markets of the world, we should take courage and push out. The world is, after all, but one, and any man's customers are wherever he can find them. He must draw his foreign customers as he draws his home customers, by catering to their precise wants and by consulting their habits and often also their prejudices. Weights and measures clearly touch habit, prejudice and practical convenience. We must for foreign trade expect in most cases to come to foreign standards as a first condition of adaptation. Where the metric system is fully established our goods must correspond to that system or there can be no chance of their introduction. A machine tool builder can certainly expect little consideration for his tool in a metric country if every part of it, and every movement of it, and the prospective product of it, are dimensioned in feet and inches. It would be absurd to expect to sell such a tool in any country which is dominated by the meter, and the wise and sanguine builder, if he has hopes of an extensive trade, will at once adopt the metric measures for such of his foreign product as demands it. There is, on the one hand, nothing to prevent his doing this, and there is, on the other hand, no apparent reason why he should wish to compel his competitors to do likewise. The chances for a "scoop" are all in favor of his going it alone.

The machine-tool builder is perhaps as well situated as any class of manufacturers for the individual and independent manufacture of his machines to metrical measurements. Castings and the patterns for them are, of course, entirely within his control. The expense involved for any changes in them cannot be shouldered upon outsiders, and there should, in fact, be little of such expense involved. The standard sizes of bar iron or steel he uses comparatively little of, so that little trouble or expense would come to him in that direction. A special equipment of drills, taps and small tools would be involved, and the products of the screw machine—the bolts, nuts, cup-screws, set-screws and such supplies, usually obtained from the machine screw factories—would have to be arranged for, which would not be difficult. The education of the men to the use of the metric measures, especially with jigs and gages all provided, would be a light task.

That it would ever be possible in any country to make an immediate and complete change from one system to the other is scarcely to be thought of. There must at best be a long system of transition, in which both systems would run side by side. Any governmental sanction could not avert and scarcely modify this. The tool builder, with any great hopes of large foreign trade, must find himself adopting metrical dimensions for portions at least of that trade. He will at once be ready for whatever metrical dimensioned machinery there may be demand for at home, and will so far be ahead of his competitors. If there is any business for him it will be all the more secure for him, at least at first, to seek as little co-operation, compulsory or otherwise, as possible.

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Questions and Answers.

Name and address of writer must accompany every question. Questions must pertain to our specialties and be of general interest. We cannot undertake to answer questions by mail.

(5) T. H. M. writes: In an account of an air ship with which Mr. Maxim is said to have had something to do I notice a statement to the effect that the section of the ship is double and is filled with hydrogen gas confined in separate compartments. Will you kindly tell me what is the object of this; is it to increase the buoyancy of the air ship? A.—There is really in mechanics no such thing as buoyancy. When we speak of a thing as being buoyant we mean simply that it is lighter than the element in which it is immersed or on which it floats; such, for instance, as water or air. Hydrogen gas is lighter than air, and therefore if the air is excluded from the chambers formed in the double section of this ship and hydrogen gas takes its place the specific gravity of the ship as a whole is thereby lessened. It would be still further reduced, however, if the air were to be pumped out from these spaces and nothing put into its place; that is to say, if a vacuum could be produced in these spaces and maintained. This, however, would subject the walls of these spaces to unbalanced atmospheric pressure which they are probably not able to withstand, but which they can stand when the internal pressure of hydrogen gas is made nearly, or perhaps quite equal, to atmospheric pressure. Gas is not put into an ordinary balloon to "make it lighter," but to distend it and thereby make it displace air to an amount which would weigh more than the combined weight of balloon and contained gas. If the gas could then be taken out, leaving a vacuum, without collapsing the balloon, it would be more "buoyant" still.

(6) W. T. Catskill, N. Y., writes: Is there any way of hardening cold rolled shafts besides the potash method, as potash only hardens for a depth of 1-16 inch at each process. I thought perhaps you could tell me of something better. The shafts are 4 inches diameter and turned to a point. A.—Cold rolled shafting can be case-hardened by the ordinary method of case-hardening with bone charcoal, but it is doubtful if the shafts can be in this way hardened deeper than one-sixteenth of an inch. 2. Is there any way of making babbitt metal remain in cast-iron boxes which have been bored. I have tried tinning them and have tried it with resin, but the metal seems to shrink away from the boxes after having cooled, leaving it loose. A.—This difficulty is partially overcome by previously heating the boxes so that they also will shrink.

It

is best, however, to expand the metal within the boxes after pouring by means of forcing a drift through them, or by hammering after pouring the box, and this is the method resorted to where the best results are obtained.

(7) S. D. S., Los Angeles, Cal., asks: What is the difference in friction between steam and water passing through a 1¼-inch pipe 50 feet long, under a pressure of 200 pounds per square inch? All conditions being equal, such as ells, tees, etc. A.—D'Arcy's formula for the friction of fluids in pipes is:

$$p = \frac{Q^2\, w l}{c^2\, d^5}$$

in which
p = loss of pressure in pounds per sq. in.;
Q = discharge in cubic feet per minute;
w = density or weight per cubic foot;
l = length of pipe in feet;
c = a constant;
d = diameter of pipe in inches.
For water $w = 62.5$;
for steam at 200 lbs. abs. $w = .4431$;
for water and 1¼ inch pipe $c = 84.8$;
for steam and 1¼ inch pipe $c = 47$.
Substituting for water

$$p_1 = \frac{Q^2 \times 62.5 \times l}{7200 \times d^5} \qquad (1)$$

Substituting for steam

$$p_2 = \frac{Q^2 \times .4431 \times l}{2200 \times d^5} \qquad (2)$$

Dividing (1) by (2).

$$\frac{\frac{Q^2 \times 62.5 \times l}{7200 \times d^5}}{\frac{Q^2 \times .4431 \times l}{2200 \times d^5}} = \frac{62.5}{7200} \div \frac{.4431}{2200}$$

$$= \frac{62.5 \times 2200}{7200 \times .4431}$$

$$= \frac{137000}{3180}$$

$$= 43.2$$

That is, the friction loss of the water would be 43.2 times that of the steam. Our calculations are by the slide rule and are not minutely accurate, but are more so than existing knowledge of the subject.

(8) P. S. C., Passaic, N. J., has a cable reel 10½ feet long, 8 feet diameter over the flanges, and weighing 60,000 pounds, and he desires the dimensions of a shaft to safely carry the reel. A.—In most cases of this kind it is a question of size of bearing rather than strength of shaft. Each bearing must carry 30,000 pounds, and for the speed at which such bearings turn we should expect a pressure of 200 pounds per square inch of projected area to give satisfactory results.

$\frac{30000}{200} = 150$, which is the proper projected area of each bearing, and it may be made up by various proportions of length to diameter. If we adopt a length equal to about twice the diameter, a bearing 8½x17½ inches would have the right area, or, for even figures, it might be made 9x16 inches. The strain on such a shaft may be regarded with sufficient accuracy as a shearing strain. A 9-inch shaft would have 63½ inches cross section and $\frac{30000}{63\frac{1}{2}} = 473$ pounds of shearing stress to each square inch, which is, of course, a trifling strain for the material. You have not given and we have not considered the strain on the rope, which would, however, probably be small in comparison with the weight of the reel.

Personal.

Ambrose Swasey, of Cleveland, Ohio, has been elected a Fellow of the Royal Astronomical Society of England.

Kindly oblige us by sending in personal items regarding changes of foremen, superintendents and others prominently connected with the machine business.

Mr. A. Thompson, until recently superintendent of the Shelby Cycle Manufacturing Company, has resigned, to accept position as superintendent of the New Rib Manufacturing Company, of Shelby, Ohio.

N. W. Thomas, a tool maker, who has been employed in the experimental department of the factory of the National Cash Register Company, at Dayton, Ohio, has been appointed first assistant in the lock and drill room.

Mr. Howard Abbott, who was formerly master mechanic with the Westinghouse Electric & Manufacturing Company, of Pittsburg, has been appointed superintendent of the John Bertram & Sons' Canada Tool Works, at Dundas, Ontario.

Mr. Frank Mossberg, of the Mossberg & Granville Manufacturing Company, Providence, R. I., sailed for Europe on the 2d inst. It is his intention to visit England, Germany, France, Belgium and probably Hungary and Russia in the interest of his company.

Mr. C. L. Carman, formerly head draftsman and latterly designer-in-chief of the Gates Iron Works, has resigned to accept the position of general superintendent with the F. C. Austin Manufacturing Company, which is about to build new works near Chicago, Ill.

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Inquiries for Machinery.

Those who make, or may know of the makers of such machinery as is called for below, will oblige us by sending name and address, mentioning the number of the inquiry. We cannot forward catalogs. We have inquiries as follows:

32—From Germany. Machine for screwing in square-headed railway tie spikes or lag screws. These machines must bore the holes and drive the screws.

33—From Germany. A spiral attachment for use on planer and shaper tables, with index plate for use in gear tooth planing, and capable of taking in work up to 45 centimeters (about 18 inches) long and 30 centimeters (about 12 inches) in diameter.

34—Machines for making paper bags and envelopes.

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A bill to exempt new manufactories from taxation for ten years has been introduced in Tennessee. Its purpose is to encourage the building of cotton mills.

Annealing Steel.

Editor American Machinist:

In your last issue you publish an article taken from "Sparks From the Crescent Anvil," in which I am made to say that, in some of our annealing we heat in hot lead and cover up in *Saw Dust*—a slip of the pen; this should read Coal Dust. I have never seen the article in print before. Please put me right.

F. A. PRATT.

Hartford, Conn.

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Obituary.

Franklin H. Corlies, for many years superintendent of the shops of William Sellers & Co., Philadelphia, died of pneumonia on the 31st of January, after an illness of about two weeks. Mr. Corlies, who was in the forty-second year of his age, came of the Poughkeepsie family of that name. He graduated in 1875 from Swathmore College, Pennsylvania, and shortly afterward entered upon his apprenticeship at the works with which he was connected at the time of his death. Upon completion of his apprenticeship, he took a special course in mechanical engineering at Cornell University, and then returned to his former employers, in whose services he thereafter remained, rising through a gang foremanship to the general supervision of their machine shops. He was an excellent foreman, loyal to his employers and devoted to his duties; yet his just and manly treatment of employés earned for him their high esteem. A widow and a son, the latter about five years old, survive him.

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Foreign News Notes.

Improvements in Mexico are proceeding so quietly that one hardly realizes what progress is being made in the South lands, nor what openings there are for American machinery and appliances.

Machinery of all descriptions is the natural accompaniment to the development of any country, and in Mexico just now very extensive orders for machinery are being given. It is required for mining purposes, in factories, on plantations and in railroad and harbor construction. The competition as to supply is very keen, and one of our foremost competitors for this trade is the British manufacturer.

During the past year very great progress has been made in the Vera Cruz harbor works, although little of it has been apparent to the general public, for the reason that much of it has been under water. The plant employed by the company doing the work consists of some of the most modern, costly and powerful sand pumps, dredgers, cranes and other machinery; yet this does not complete the wants in that particular undertaking.

The iron pier which the railroad company will use is to be brought from England; it will be about 180 feet long and will be fitted with cranes worked by hydraulic power. The contractors who have this immense undertaking in hand are S. Pearson & Son, and judicious inquiry might result in good orders for American machinery, even at this late date, if it can be proved to be equal in quality to that supplied by British manufacturers.

The new tariff of Tasmania went into effect on January 1, and exempts from duty agricultural implements and machinery; also copper wares and zinc blocks and sheets; and the following have been placed on a schedule of 10 per cent. ad valorem, viz.: Boilers, detonators, evaporating ovens, iron and steel nuts, belts and washers, valves for water mains and typewriters. A. F. TENNILLE.

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Commercial Review.

NEW YORK, Saturday Evening, Feb. 5, 1898.

STEAM POWER PLANTS.

A tour of investigation of many steam engine and boiler sales offices in this vicinity has shown much to encourage us in a belief in the improving tendencies of business. It must be acknowledged that sellers not infrequently report January sales as comparatively light, and thus it is difficult to form a consistent opinion upon the state of trade; but weighing all considerations, such as the season of the year, the very favorable statements in certain quarters and the feeling of coming prosperity, which extends through the manufacturing industries generally, we think that the past month may be considered a satisfactory one for the steam power machinery fraternity, and one consonant with improved business undertone.

The head of the New York branch of a certain steam pump company sets forth the situation in what we are inclined to accept as its true light. "Business," says he, "is moving on an up grade. It is not going up vertically, but on an incline. I think that it has been doing so since 1893 except for the slump in 1896. I have talked with presidents and other officials of many cotton mills, woolen mills and other factories in New England and elsewhere, and they predict that the business of this year will be better than for any year since 1893. Our own January business was very good indeed, being ahead of that of December, and we have a fine trade planned out for February. Certain engine sellers tell me that for the first half of January their business was hesitating, buyers being disinclined to close up contracts, but that subsequently orders have been taken with facility."

The two great plums of the year in this market for the engine and boiler manufacturers, as well as for others who make different kinds of electric railway material, will probably be the Metropolitan and the Manhattan railway installations. It is thought that, for the former, specifications may be given out in about three months. It is said that according to present plans 25,000 horse power of boilers will first be put in and 50,000 horse power of engines; afterward 25,000 horse power additional of boilers and 20,000 horse power of engines. The boilers will not unlikely be arranged in units of 5,000 horse power each, and the award of the contracts distributed between more companies than one. These plans are liable to undergo modification because the engineer of the road is retiring, and his successor may have other ideas.

The Manhattan elevated's transformation into an electric road rests as yet in undefined expectation, but it is a confident expectation nevertheless.

An electric road is to be started in New Rochelle, N. Y., the president of the Nassau road in Brooklyn being one of its prime movers. It will install up-to-date apparatus, all direct connected and consisting of large units.

Colgate & Co., soap manufacturers, of Jersey City, have been making a test of their plant with a view to determining the advisability of installing an electrical transmission system. If they make the change they will need new boilers, and doubtless, enginess also.

It is said that the Pacific Coast Borax Company will put up a building in this vicinity for which a steam plant will be required.

We have not heard that the Park Row Building, of this city, has yet awarded its contract for engines. They are to consist of the following: Two 320, one 250, one 120, one 80 and one 40 horse-power respectively. Most of them are to be tandem compounds; the two smallest are intended for "booster" engines. The horse-power of the six runs up to 1,130, which is a pretty fair amount for an office building.

Not many buildings hereabouts have lately closed up contracts for steam power plants. The Hospital for the Ruptured and Crippled has, however, bought Ames engines.

An engine and boiler of the above make have been ordered for shipment to Burmah to furnish power for lighting the office of a newspaper in Ragoon. Some Ideal engines have recently been sold for Yokohama. The Lidgerwood Manufacturing Company, which is very busy, has just taken, among others, an order for a hoisting engine for Australia, and is building a large dredging engine plant for Belgium.

A late Government order for engines and blowers is that for the revenue cutter No. 6, building in Baltimore, which has been awarded to the Buffalo Forge Company. This engine is of the double inclosed upright type. The fan is a special and peculiar discharge machine, which is particularly adapted to limited space.

Orders for four engines for electrical work in Argentina were booked the other day at a local office. Others from the same market are expected soon to arrive. The Jackson & Sharp Company have shipped twenty-seven electric cars and five sleeping cars to Buenos Ayres.

The local office of the Frick Company, Waynesboro, Pa., informs us that the sales of ice and refrigerating machines for the present season, beginning about September 1, have already been 100 per cent. ahead of the corresponding one a year ago. The sales of the Frick Company's engines are now quite largely in the Northwest, but of ice machines more largely in the East. The export field is not just now especially active.

BOILERS IN PARTICULAR.

The great duel between two certain water tube boiler companies still goes on. It is now so celebrated that the effect upon the boiler market generally is likely to be deplorable. Every man now who buys a boiler, whether it be to put on his laundry range or to cook his coffee in, expects about ninety and ten tens off the list. But he is mistaken if he supposes that the mutual acrimony of two concerns has made all the others lose their heads. It is, indeed, likely to do serious damage to prices, but if water tube boiler builders will maintain conservatism and nerve a little longer they may be able to tide over the present crisis without a universal slump. We hear it remarked in one quarter that prices are regaining strength in some instances and that the two contestants above referred to are now beginning to ask higher figures in their preliminary or initial bids upon a contract. Although most boiler sellers with whom we have conversed do not notice such improving tone, it is a good sign that there are symptoms of it in any quarter.

In this connection we may say that an engine seller remarks the fact that for a recent engine contract, where several bids were put in, one of the higher ones rather than one of the lower ones was accepted. This is a most healthful symptom.

The agent for a well-known make of water-tube boilers tells us that the best market for them seems now to be in the West, both because the people out there have more ready money and because they are more disposed than Easterners to put in new boilers if they find that the saving by superior economy in operation will be greater than the interest upon the money expended. He believes that water-tube boilers are obtaining increased favor as compared with the return fire tubular ones, and mentions certain old concerns which are taking up their manufacture.

A certain well-known company which makes boilers and spiral-riveted pipe re-

ports that the latter is in good demand at home and quiet abroad, except in Mexico. Boilers have not been in good sale recently, but the inquiry for future installations is better than usual. It finds that the prospective work is principally for office building and street railway plants.

The Hogan Boiler Company, Middletown, N. Y., had on hand during the latter part of January contracts aggregating 80,000 horse-power, with about 60,000 horse-power more in sight. Most of the units contracted for are of 250 horse-power each, the boilers weighing from 35,000 to 37,000 pounds, and the draftsmen have been kept as busy as bees.

We will close the consideration of the boiler market with a few words from a most encouraging interview with the New York representative of a Western company: "Since I have been in New York I never have seen business better. Not only are there several large contracts in prospect, viz.—the Manhattan and Metropolitan—but there are a good many smaller ones of from 800 to 1,500 horse-power. Some of these are for well-known manufacturing companies, which propose to erect buildings in this neighborhood."

WOODWORKING AND MISCELLANEOUS NOTES.

The following letter from the Defiance Machine Works, Defiance, Ohio, manufacturers of wood-working machinery, indicates a revival of activity in wagon building:

"At the present time we are some three months behind with our orders. We are putting up a new building, have ordered a new Pond Machine Tool Company planer, 36 by 36 inches by 12 feet, with two heads, and one of their 6-foot arm radial drills. We expect to increase our capacity by the improvements we have under way about 25 per cent. Our customers, that is, the wagon manufacturers and vehicle builders generally, are very busy. The prospects for a much larger business in spring are very encouraging. From what we can learn the machine-tool builders as a rule are not busy. We cannot account for this; if you can we would be glad to hear from you."

In regard to the point raised above, that machine-tool concerns are not at present busy, we can only say that, so far as our observation extends, the opposite is generally the case. There are exceptions to all rules, and especially is this axiom true in regard to trade activity. Two persons, starting out to investigate it, may arrive at utterly different conclusions, because they view different parts of the field. For this reason too many trade reports, especially such as are published spasmodically in the daily newspapers, are worse than useless. It is only by making a broad investigation as, for instance, by communicating with many important houses in a leading business center, that reliable information can be obtained. Such information we endeavor to obtain for our readers.

The J. A. Fay & Egan Company, of Cincinnati, is shipping twelve carloads of wood-working machinery to the Russian Government at St. Petersburg, and expects some further orders of great magnitude from Russia.

The Bickford Drill & Tool Company, of Cincinnati, is now very much engrossed with work; the shops are being run on night time.

Dietrich & Harvey, Baltimore, have lately taken a number of export orders, including one from London and two from Berlin, for planers. They have recently shipped five planers to France, two to Budapest, several to Mexico and one to Costa Rica.

The Frontier Iron Works, Detroit, Mich., inform us that they have a largely increased demand for their vertical gas and gasoline engines, of which they are putting new sizes upon the market. The sales are especially for light machinery and mill work.

The New York Chamber of Commerce,

Continued on page 36.

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Business Specials.

Gear wheels, gear cutting. Grant; see page 16.

The Standard Scales. Factory, Bellefonte, Pa.

Power hammers, Jenkins & Lingle, Bellefonte, Pa.

Forming Lathes. Mer. Mach. Tool Co., Meriden, Conn.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N. Y

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Wants.

Situations and Help Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Situations Wanted.

Experienced mech. draftsman, Box 54 AM. MACH.

Position as foreman or layerout in boiler works; up-to-date man. Box 67, AMERICAN MACHINIST.

First-class draftsman and designer, tech. graduate, with six years' best exp. Box 37, AM. MACHINIST.

Pattern maker wants a position; has had three years' experience as foreman. Box 70, AMERICAN MACHINIST.

Thoro'ly prac. d'ftsman and designer; 3 years' shop exp., 5 years d'fting, desires a change, Box 57, AM. MA.

A draftsman and designer, exp. and successful in working up new mchy., would change; has very best record and highest references. Box 62, AM. MACH.

Practical machinist, 20 years' exp. various lines, several on gas eng., draftsman, desires foremanship; gas eng. preferred; would accept combination position, erector and salesman gas engs.; now foreman; will change March 1. Address Box 65, AM. MACH.

Situation wanted as machine shop foreman or toolmaker by practical mechanic; 10 years' experience on new inventions and interchangeable system; very successful in past; best of references from last and previous employers; habits strictly sober. Box 61, AM. MA.

Engineer, 32, thorough technical education; member A. S. M. E.; experience as constructing eng. and manager, desires change, knows modern methods of mach. designing and shop practice; exp. on construction Corliss and other engs., air compressors, ice mach. and the most improved gas eng. practice; competent to assume charge of works of any magnitude; pos. as gen. supt. or chief eng. wanted; highest testimonials from all past employers. Box 68, AMERICAN MACHINIST.

Help Wanted.

Wanted—Instructor in machine work for technical school, near New York. Man with strong practical ability, bet. 30 and 40 years' of age, with at least a high school education and with some experience in teaching desired; salary $1,200 to $1,500. Address at once "Technical School," care AMERICAN MACHINIST.

Wanted machine shop foreman accustomed to high speed engine work; state fully experience. Box 60, AMERICAN MACHINIST.

A first-class man to run small steam pump shop; must be able to turn out good, quick work at small cost; state age, salary; give references. Box 69, AMERICAN MACHINIST.

Wanted—An A No. 1 draftsman with experience in locomotive work as well as general machinery; a good salary to competent party; location in Ohio. Address Locomotive Draftsman, care AM. MACH.

Mechanic capable of designing small tools, jigs and special machines for large plant, and competent to take full charge of department doing this class of work. state experience and references. Address Beans, care of the AMERICAN MACHINIST.

Shop foreman; to take charge of machine shop for a ship building concern; work principally marine engines and repairs; new shop and new tools; man must be a hustler, up in modern methods and have best references. Box 63, AMERICAN MACHINIST.

Wanted first-class man familiar with automatic engine trade; must have experience and some engineering ability; to operate in South and West, east of Mississipi river; state experience, rate of salary for first year and how soon available. Box 64, AM. MACH.

Wanted—First-class working foreman for blacksmith, hardening and tempering department, in Eastern N. E. must thoroughly understand hammer and drop forge work and designing dies for same; also treating tool and high carbon steels in all machine shop conditions, and in machine parts of a high order; no person will be considered who is over 45 and has not had charge of of such a department; state experience fully and wages expected. Box 53, AMERICAN MACHINIST.

Miscellaneous Wants.

Advertisements will be inserted under this head at 30 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Job lot radiators, 12 1-2c. ft., S. M. York, Cleveland, O.

Book, Dies & Die Making, $1. J. L. Lucas, Prov. R. I.

The Dutton Wet Twist Drill-Grinder is sold by the Garvin Machine Co., New York City.

For Sale—Second-hand drill presses, engine lathes and planers. Dietz, Schumacher & Boye, Cincinnati, O.

Best and cheapest Bolt Header, made by Baush & Harris Machine Tool Co., Springfield, Mass.

Light and fine mach'y to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

For Sale—Patent Office Gazettes and Indexes, 1882 to 1893 inclusive, cost $60; will sell for $20. 1581 Broadway, Cleveland, Ohio.

Wanted—A good second-hand heavy milling machine; Must be in first-class order and cheap. Address Box 66, AMERICAN MACHINIST.

Wanted second-hand power press, equal to Farrel Foundry manufacturing; no less then 2 1-2 inch stroke. Reply to Dunham Machine Works, Danbury, Conn.

Lathes, planers, drills, milling machines, vises, also brass working machinery second-hand; must be modern and in first-class condition. C. C. Wormer Machinery Co., Detroit, Mich.

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15 Beekman Street, NEW YORK.

Continued from page 35.

in response to a petition addressed to it by merchants and manufacturers, has memoralized the President of the United States to take measures to protect the commercial treaty rights of this country in China. It is notable that a considerable proportion of the signers of the said petition were representatives of the machinery and allied interests. They included five locomotive companies, which is not surprising in view of our recent large exports of locomotives to the Far East. It is said that 386 were sent from this country to various parts of the world in 1897, out of the 1,251 built here by standard manufacturers.

The British steamer "Majestic" has been chartered to carry to the Finland Government a general cargo, including twenty-two Baldwin locomotives, which will be the first of that make sent to Finland in twenty-five years.

Quotations.

NEW YORK, Monday, February 7.

Iron—American pig, tidewater delivery:

No. 1 foundry, Northern	$11 75 @ $12 25
No. 2 foundry, Northern	11 00 @ 11 50
No. 2 plain, Northern	10 75 @ 11 25
Gray forge, Northern	10 25 @ 10 50
No. 1 foundry, Southern	10 75 @ 11 00
No. 2 foundry, Southern	10 25 @ 10 50
No. 3 foundry, Southern	10 00 @ 10 25
No. 1 soft, Southern	10 75 @ 11 00
No. 2 soft, Southern	10 25 @ 10 50
Foundry forge, Southern	9 75 @ 10 00

Bar Iron—Base—Mill price, in carloads, on dock: Common, 1.07½ @ 1.10c.; refined, 1.15 @ 1.20c. Store prices: Common, 1.25 @ 1.35c.; refined, 1.30 @ 1.50.

Tool Steel—Ordinary sizes, standard quality, 6 @ 7c., with some grades perhaps a little less; extra grades, 11 @ 12c.; special grades, 16c. and upward.

Machinery Steel—Ordinary brands, from store, in small lots, 1.45 @ 1.60c.

Cold Rolled Steel Shafting—Base sizes, from store, in small lots, about 2.20c.

Copper—Carload lots, Lake Superior ingot, 11 @ 11¼c.; electrolytic, 10⅞ @ 11c.; casting copper, 10¾ @ 10⅞c.

Pig Lead—Carload lots, 3.62½ @ 3.65c., f. o. b. New York.

Pig Tin—For 5 and 10 ton lots, 14.00 @ 14.10c., f. o. b.

Spelter—Carload lots, 4c. and upward, New York delivery.

Antimony—Fair wholesale prices on the various brands, 7½ @ 8c.

Lard Oil—Prime city, present make, commercial quality, in wholesale lots, 42 @ 43c.

▲ ▲ ▲

Manufacturers.

The plant of F. A. Walsh & Co., of Milwaukee, has been destroyed by fire.

P. Reiley & Son, of Newark, N. J., have erected a new building and will install new machinery.

The Clinton County Fire Brick Company, of Lock Haven, Pa., is to erect works at Millhall, Pa.

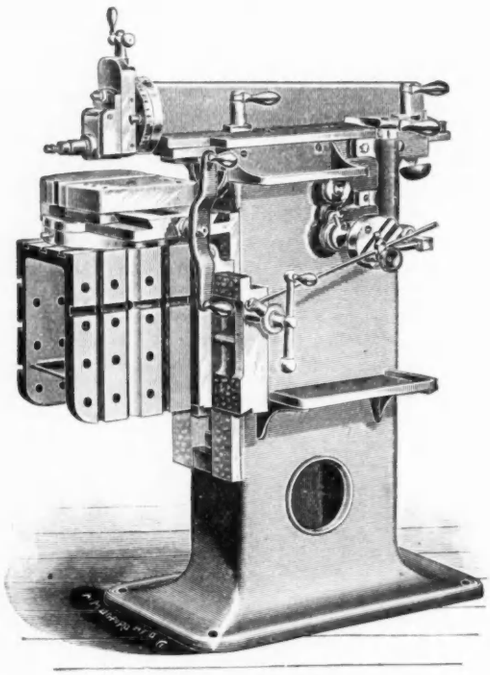
The Imperial Electric Light, Heat & Power Company, of St Louis, is preparing to commence work on a power house.

The Armington & Sims Engine Company, Providence, R. I., has reorganized, and Frederick Bushnell will be the new manager.

The Standard Pneumatic Tool Company, of Chicago, has been incorporated by C. A. Williams, Frank T. Kinnare and Hugh J. Kearns.

The Columbus (Ohio) Forge & Iron Company has been incorporated by David Buel, W. W. Franklin, E. C. Humphreys, B. N. Huntington and others.

At New Castle, Pa., the Maxwell Gas Engine Company has been formed with the following officers: President, Ex-Sheriff Douthitt; vice-



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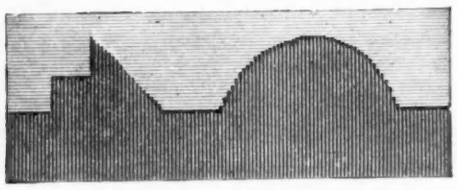
15-inch Hendey Shaper.

Latest Improvements.
Useful Attachments.
Strong and Powerful.

...FOR...

Die Work, Tool Room or General Shop Work.

The stroke can be adjusted for curves with machine in motion. The stroke can be adjusted for angles with machine in motion. The stroke can be adjusted for irregular work with machine in motion. It has adjustable table for planing taper work; table can be removed for fastening work to apron. Has a strong graduated swivel vise. Quick work, rapid changes, modern ideas.



This cut shows how the stroke can be adjusted with machine in motion by micrometer; adjustment fine and delicate SEND FOR CIRCULAR.

THE HENDEY MACHINE CO.

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Agents for the Pacific Coast—PACIFIC TOOL AND SUPPLY COMPANY San Francisco, Cal.
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Piston Rod and Valve Stem Packing.

THE BEST OF ANY KIND.

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ELECTRIC LIGHTING and POWER TRANSMISSION SYSTEMS

For Mills and Factories.

SLOW SPEED POWER GENERATORS.
MULTIPOLAR and BIPOLAR DYNAMOS and MOTORS.
CLOSED IRONCLAD MOTORS, for dusty or wet places.

Write for descriptive bulletins.

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Let us quote you on

Lathes, Planers, Shapers, Drill Presses, Gear Cutters, Milling Machines, Screw Machines, Cutter Grinders, Boring Mills, Profilers, Tappers, Spring Coilers, Presses, Drop Hammers, Etc.

New and Second-Hand.

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MANUFACTURERS,
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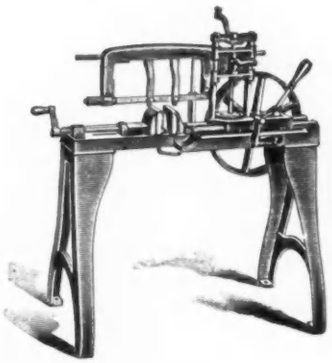
BERLIN STORE:
The Garvin Machine Co., m. b. H., 17 Burg Strasse, Berlin, C., Germany.

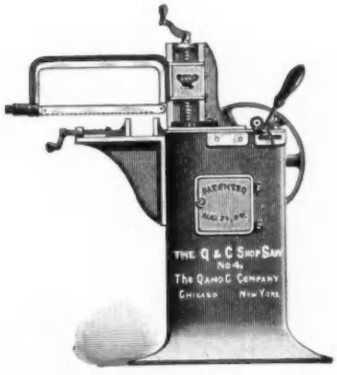
The

Q & C

Automatic Shop Saw.



Special Machinery
For Cutting All Kinds of Iron and Steel Cold. . . . . .



The Q & C Co.,

700-709 Western Union Bldg., CHICAGO, ILL.

100 Broadway, NEW YORK, N. Y.

537 Mission Street, SAN FRANCISCO, CAL.

president, S. E. Maxwell, and treasurer, Paris Shoaf.

Bamford Bros. are to erect at Charleroi, Pa., a new silk mill.

At Rockford, Ill., the Mechanic's Foundry was recently gutted by fire.

Col. A. J. Thorp & Son, of Winston, Ky., are preparing to erect a sawmill.

John Hendel & Son, of Philadelphia, are to make an addition to their plant.

The Archibald Wheel Company has decided to erect a factory at Damariscotta, Me.

At Bridfodle, Del., H. P. Cannon will commence the erection of an addition to his factory.

The Rock River Woolen Company, at Janesville, Wis., is to make extensive improvements.

R. B. Denneed, of Canton, Pa., contemplates the erection of a planing mill at So. Akron, O.

Meanney & Co. contemplate the erection of a power building on Rhode Island street, Buffalo, N. Y.

The foundry of the Hooven, Owens & Rentschler Company in Hamilton, Ohio, was recently burned.

At Centreville, Ala., Hunnicut & Neil, of Haflin, Ala., is contemplating the erection of a sawmill.

G. Moser & Sons, of Cincinnati, is contemplating the location of a new plant at Covington, Ky.

The plant of the Bonneville Cement Company near Siegfried's Bridge, Pa., was recently destroyed by fire.

Geo. P. Chappell, of 24 State street, New York, is preparing plans for a factory to be erected in this city.

The Hamilton Foundry & Machine Company, Hamilton, Ohio, was recently burned, the damage being about $12,000.

The Lisbon Woolen Mills, at Lisbon, Ohio, which were recently destroyed by fire, are to be rebuilt and additions made.

Gill Brothers & Co., E. M. Moody and Walter Dixon are interested in the erection of a clay works at Steubenville, Ohio.

At Ivy Rock Station, near Norristown, Pa., Joseph Potter, of Pawtucket, R. I., is to erect a building for the manufacture of textile machinery.

The foundry of the Dam Manufacturing Company, at Carrollton, Mo., was recently entirely consumed by fire. The plant, it is understood, will be rebuilt.

The Geo. W. Church Company, of New York city, has been incorporated to manufacture machinists' supplies. Directors: Geo. W. Church, Wm. T. Church and W. M. Kinder.

Caird & Hawksworth, of Helena, Mont., have recently built an addition to their foundry and are now engaged in erecting an addition to their machine shop. They expect to place new machinery.

The Rome (N. Y.) Planing Mill Co. has been incorporated. The incorporators are H. Owens, 223 Turin street, Rome; Ed. Evans, E. T. Williams and J. Evans, all of Rome, N. Y.

The Kellett-Chatham Machinery Company, of Waco, Tex., has been incorporated; capital stock $50,000. Incorporators: W. M. Kellett, E. Rotan, W. R. Clifton and others. Purpose: To manufacture, repair, buy and sell machinery.

The Carpenter Automatic Valve Company was recently incorporated at Trenton, N. J. Wm. C. Bulitt and Wm. Morris, of Philadelphia, Pa.; John Tuohy, of Norfolk, Va., and Alex. Dreer, of Camden, N. J., are the incorporators.

The Ferro-Carbon Casting Company, of Philadelphia, Pa., has been incorporated. John Hoskin, J. K. Caldwell, Samuel Hufty, Alfred C. Rex and C. A. G. Riege, of Philadelphia, are the incorporators.

Articles of incorporation have been filed with the Secretary of State by the American Iron & Steel Company of Troy, N. Y. It is proposed

to buy and sell iron, steel and other metals. The capital stock is $25,000. The directors for the first year are John E. Gaitley, David H. Friedman, and Frank White, of Albany; John Robinsteen, of Philadelphia, and Benjamin F. Porter, of Philadelphia.

The Cold Air Refrigerating Company, of Jersey City, N. J., has been incorporated. K. F. Dana and Wm. M. Riley, of New York, and Stephen W. Wood, of New Jersey, are the incorporators.

A company, to be known as the Iroquois Cement Manufacturing Company, has been organized and it is expected this company will erect a factory at Bergen, N. Y. Mr. A. D. Coffin, of Oakfield, N. Y., is interested.

The Emergency Horseshoe and Supply Company, of Jersey City, N. J., has been incorporated. Geo. W. Butles, of Jersey City; Wm. Butles, of Brooklyn, and Frederick W. Peckham, of New York, are the incorporators.

The Edwards Sad Iron Company, of Camden, N. J., has been incorporated to manufacture metal implements. Thos. Cross Edwards and Geo. M. Thompson, of Philadelphia, and Jas. Finley, of Camden, are among the incorporators.

The Northern New York Beet Sugar Company, the chief office of which is in Watertown, N. Y., contemplates the erection of a beet sugar factory at that place. John J. Kanaley, of Syracuse, N. Y., and Chas. Kilkenny, of Utica, N. Y., are interested.

The Davis & Egan Machine Tool Company, Cincinnati, Ohio, has just received an order amounting to $10,000 from Julius Neville & Co., of Barcelona and Madrid, Spain. The order includes lathes, planers, boring mills, shapers, drill presses, radial drills, milling machines, screw machines and brass working tools.

The Davis & Egan Machine Tool Company, of Cincinnati, Ohio, has just received through their Berlin office an order for a 30x30x8 planer and a 36-inch drill press, from Heuschell & Son, of Cassel, Germany. Also an order for 36-inch lathes, automatic screw machines, and 6-foot radial drills from the Maschinen Fabrik Hohenzollern, at Dusseldorf, Germany.

The American Coffee Company, of Brooklyn, N. Y., is erecting a new power house in connection with its plant, which is about 70 feet wide and 120 feet long. The power house and boiler house have brick side wall construction and steel supports and roofing. The contract for furnishing and erecting the steel framework of the building has been let to the Berlin Iron Bridge Company, East Berlin, Conn.

▲ ▲ ▲

New Catalogs.

There are three sizes of Standard Catalogs, first authorized by the Master Car Builders' Association, 9" x 12", 6" x 9" and 3½" x 6". We recommend the 6" x 9" size for machinery catalogs. When they must be larger or smaller, one of the other standard sizes should be adopted if possible.

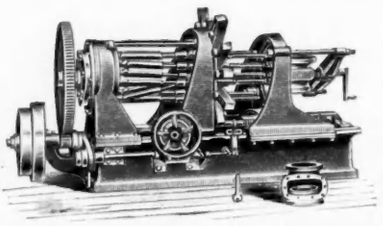
Harvey Hubbel, of Bridgeport, Conn., has sent us catalog of tapping and riveting machines, also machine screws. The catalog is 5½x6¼ inches.

The Waterbury Watch Company, of Waterbury, Conn., has sent us catalog of cyclometers, bicycle watches, etc. The catalog is 5½x8 inches.

We have received from the Morse Machine Company, Rochester, N. Y., catalog of drawing tables, drawing boards, cabinets, blue print frames and other furniture used in drafting rooms. The catalog is 5½x8½ inches.

The Chandler & Taylor Company, of Indianapolis, Ind., has issued a new catalog illustrating and describing a new design of automatic, high-speed engine. It is a particularly attractive publication of its class, and will be sent free to all readers of the "American Machinist" who send address.

HORIZONTAL ADJUSTABLE 16-SPINDLE DRILLING MACHINE



For Drilling Holes ⅛" diameter sixteen at a time in valve flanges, or a less number of larger or smaller diameter grouped in circles, squares and other forms.

Vertical machines of several sizes and styles of similar character, Gang Drills, etc.

Ask for the Machinist's Catalogue.

The Pratt & Whitney Company,
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IN VARIOUS LENGTHS—9 to 15 in. SWING. Latest and Most Approved Designs. Workmanship, Material and Finish of the Highest Order.

SEBASTIAN LATHE COMPANY,
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Agents: SELIG, SONNENTHAL & CO., London, Eng.; JOHN TRAGARDH & CO., Göteborg, Sweden; E. SONNENTHAL, JR., Berlin, Germany; R. S. STOKVIS & ZONEN, Rotterdam, Holland.

Just Ready, New and REVISED EDITION.
A HANDBOOK OF
ENGINE and BOILER TRIALS and of the INDICATOR and PRONY BRAKE.
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Very fully illustrated. 8vo. Cloth, $5.00. JOHN WILEY & SONS, 53 East 10th St., New York.

"Green River" Patent Spiral Fluted Shell Reamers and Arbors in Cases.
SEND FOR CATALOGUE.

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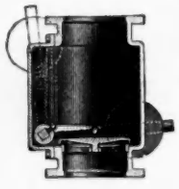
Agents in London, Selig, Sonnenthal & Co., 85 Queen Victoria Street.

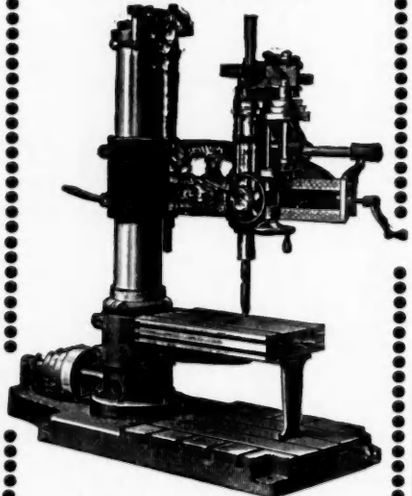


Excelsior Straight-Way Back Pressure Valve.

This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

JENKINS BROTHERS, New York, Boston, Philadelphia, Chicago.

RADIAL AND UNIVERSAL RADIAL DRILLS.



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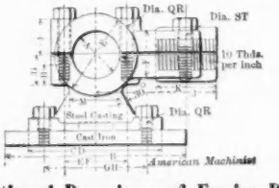
Any Man

who uses an emery grinder will find very valuable information between the covers of our 1897 catalogue.

NORTON EMERY WHEEL CO.,
Worcester, Mass.



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Four correct mechanical designs to each set. Separate Sets for Pistons, Crossheads, Connecting Rods, Crank Shafts, Main Bearings and Wheels, of **Modern High Speed Engines,** 20 to 250 Horse-Power. One set of either part for $1.00; the complete six sets for $5.00.

The Columbus Engineering Company,
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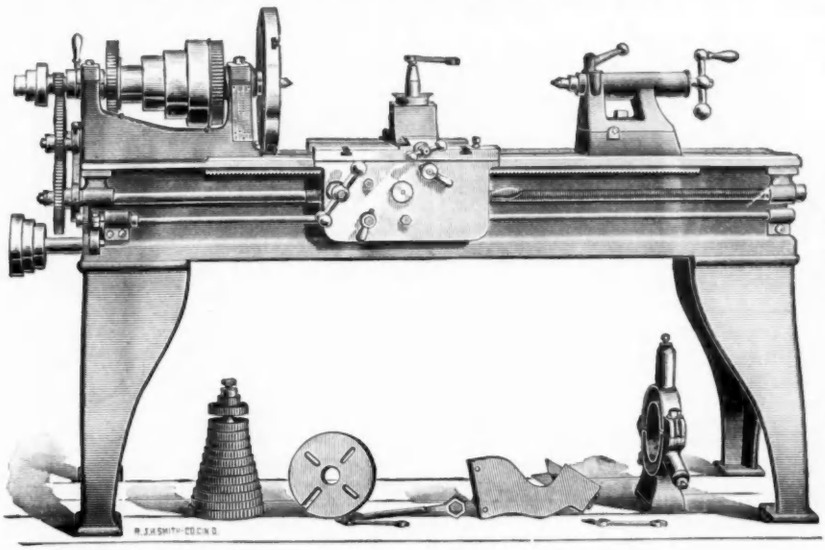
Perhaps you can save money on your

GRAY IRON CASTINGS

and get just as good metal.

ISAIAH PAGE'S SONS IRON FOUNDRY,
ALBANY, N. Y.

The Sebastian Engine Lathe, 13-inch and 15-inch.



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The Best That Money Can Buy.

The workmanship, material and finish are of the highest order throughout. It is, in fact, a modern, practical, high-grade tool at a low price. All parts are heavy and substantial, fittings are accurate and appliances convenient. Each lathe is provided with both screw and rod feeds as well as power cross feed. Gears to cut all standard threads from 5 to 36 are furnished. Steady and follower rests, large and small face plates and countershaft go with each lathe. Compound rest, raise and fall rest, friction countershaft or taper attachment will be furnished at slight additional cost. Beds up to 12 ft. in length can be furnished. Heavy spindle with large hole.

We also make a specialty of Screw-Cutting Foot Lathes.

Write for our Catalogue.

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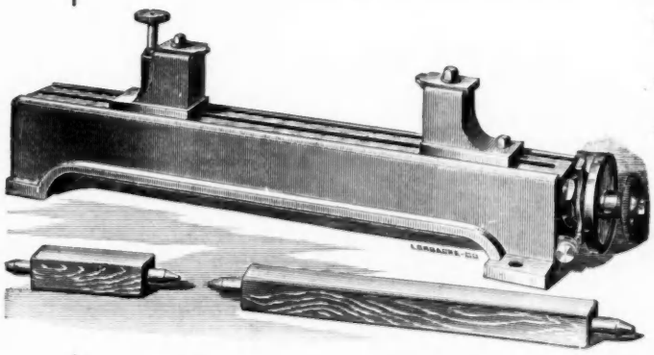
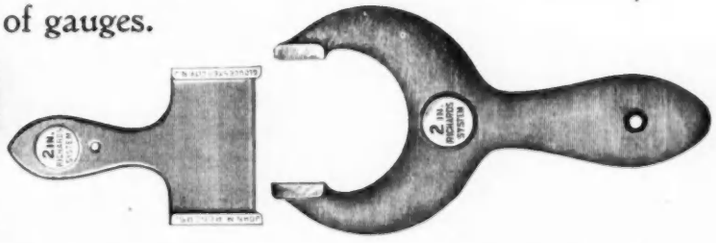
Accuracy and Precision

Can be maintained in the machine shop only by the use of the Richards system of gauges.





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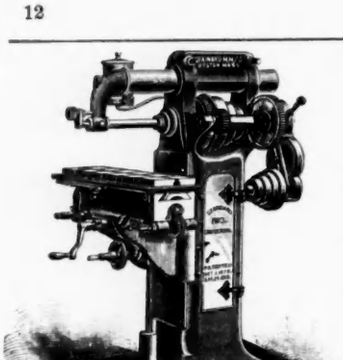

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STANDARD, UNIVERSAL, PLAIN.

Automatic Gear Cutting Machines.

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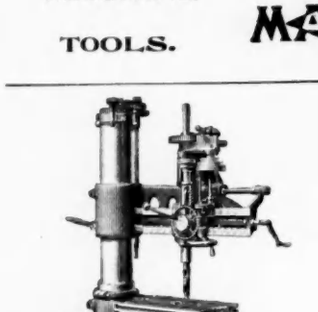
U. BAIRD MACHINERY CO.

MACHINE TOOLS.

TRADE MACHINERY MARK

PITTSBURGH, PA., U.S.A.



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Plain Table Machine.

This Drill possesses every means for rapid operations and great results. The back gears are directly on the spindle and are thrown in and out while machine is running. The tables are extra long, supported by an outside brace to prevent chatter. The machine is complete with Automatic Stop, Quick Return, Power Feed, Etc.

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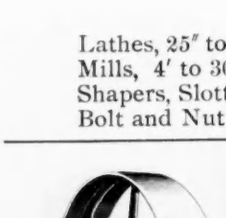
Builders of High-Class Metal Working Tools.

Lathes, 25″ to 126″ swing; Planers, 17″ to 144″ high; Boring Mills, 4′ to 30′ diam.; Steam Hammers, 200 to 40,000 lbs.; Shapers, Slotters, Drills, Riveters, Punches, Shears, Cranes, Bolt and Nut Machinery, Hydraulic Tools. Catalog free.



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that's been in constant use for 18 years, and hasn't caused a moment's delay. These clutches are very simple, are always to be depended upon, and are worth a most careful investigation They are the Frisbie Friction Clutch, and they are all right.

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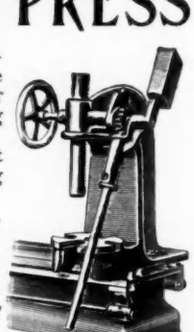

Saves marring, upsetting or springing the arbors and defacing or otherwise damaging finished work.

Saves cleaning out the centers and taking off the dogs.

Made in four sizes. Send for net prices.

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are good lathes, and have been good lathes for twenty-five years.
Most people know this.

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For instance.

This is the only Jack made that will work to full stroke in a horizontal position. Then we make other Jacks—257 kinds and Sizes.

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DIXON'S AMERICAN GRAPHITE ARTIST'S VVVH = HHHHHHH

SOMETHING NEW. DRAUGHTSMEN'S DELIGHT.
Sample 10 Cents. Try One.
JOS. DIXON CRUCIBLE CO.
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A FEW OF THE

Modern Tools

IN SHOPS LATELY BOUGHT OUT.

ENGINE LATHES.

12 in. x 5 ft. Prentice Bros., Raise and Fall Rest.
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14 in. x 6 ft Putnam, Compound Rest and special features
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12 in. Stroke, Gould & Eberhardt, Crank Motion.
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22 in. x 5 ft. Putnam.
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26 in. x 6 ft. Pond, extra heavy, side head.
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30 in. x 8 ft. Hewes & Phillips latest, ex. heavy.
32 in. x 8 ft. New Haven, late pattern.
36 in. x 8 ft. Bement.
48 in. x 12 ft. Pond, late pattern, four heads.

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Universal No. 1 Brown & Sharpe, with arm.
Universal No. 1½ Cincinnati, back gears and arm.
Universal No. 15 Brainard, tool room size.
Universal No. 13 Brainard, back gears and arm
Plain No. 2 Cincinnati, back gears and arm.
Plain No. 12 Garvin, automatic feed.
Hand No. 2 Garvin, with vise.
Vertical Bliss style, large size.

SCREW MACHINES (WIRE FEED).

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1 16 in. x 7 ft. Dustin & Hubbard.
1 18 in. x 8 ft. Dustin & Hubbard.
1 21 in. x 9 ft. Pratt & Whitney.
1 24 in. x 13 ft. Lathe & Morse.
1 27 in. x 10 ft. Dustin & Hub.
1 28 in. x 12 ft. Wood & Light.
1 32 in. x 13 ft. Bement.
1 48 in. x 18 ft. G. & S.
1 Pit Lathe, 72 in. x 18 ft.

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1 24 x 24 in. x 6 ft. Powell.
1 24 x 24 in. x 7 ft. Lathe & Morse.
1 28 x 28 in. x 8 ft. G. & S.
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1 36 x 36 in. x 18 ft., Wm. Sellers.
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1 63-in. Pond Upright Boring Mill.
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2 Willets Engine Lathes, 17 in. x 8 ft.
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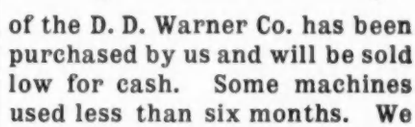

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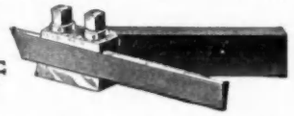

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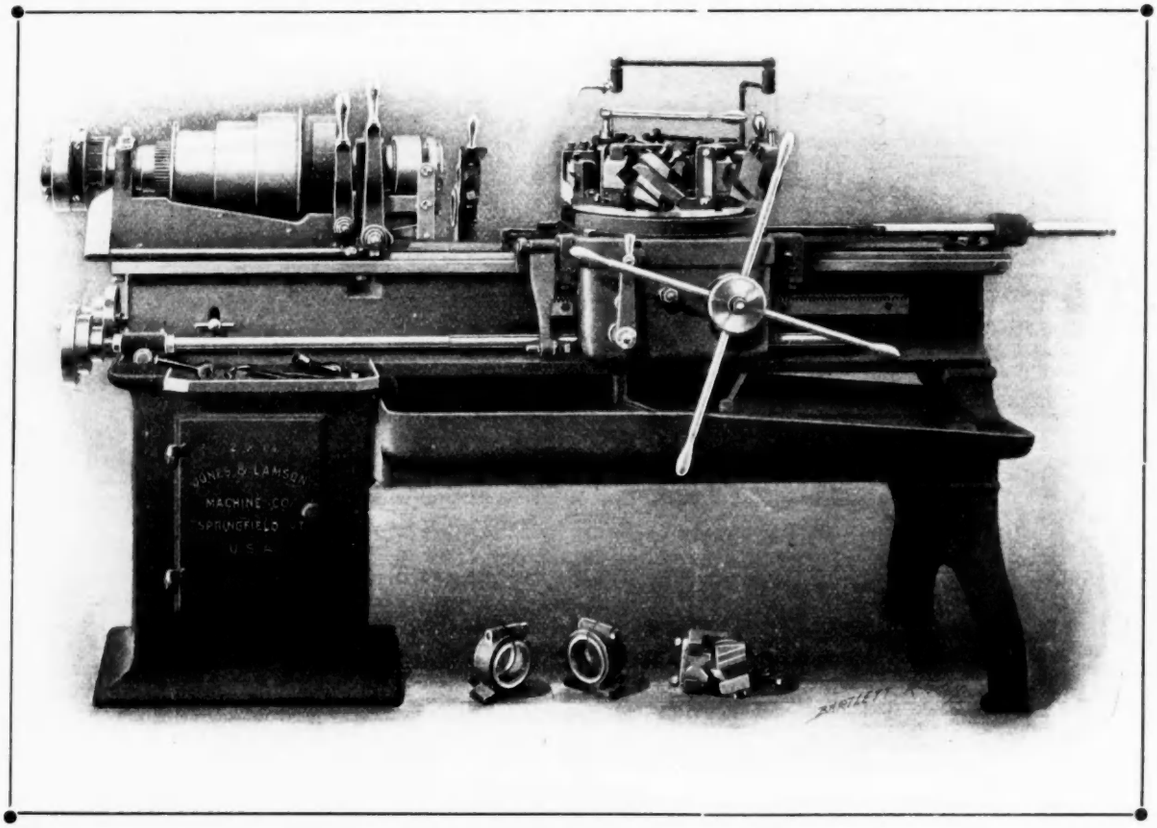

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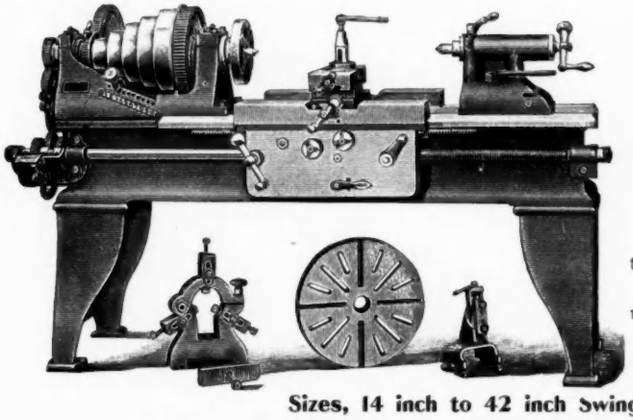

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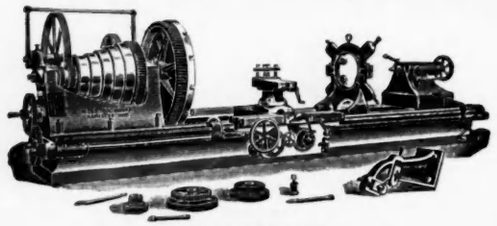

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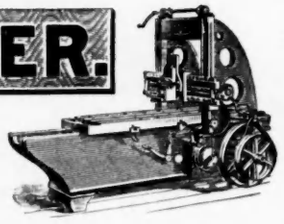

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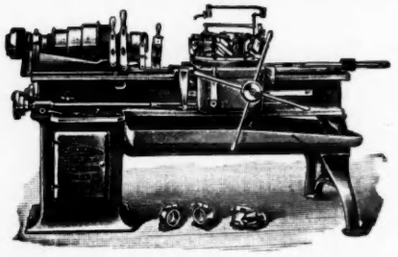

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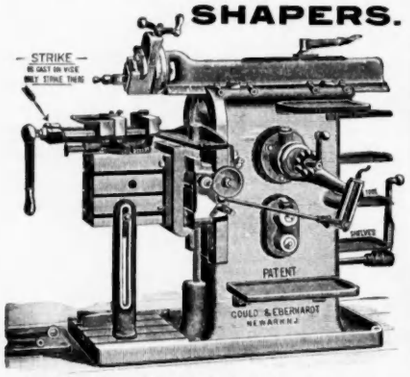

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